

Accelerating Digital Transformation

Good practices for developing, driving and accelerating ICT centric innovation ecosystems in Europe



Revision 1.1 for comments

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Innovation is a creator of opportunity. At ITU, we work together with member states in their endeavour to embrace emerging technologies like big data, 5G, cloud computing, the Internet of Things and artificial intelligence. We promote ICT entrepreneurship, facilitate digital innovation ecosystems and help accelerate digital transformation.

At the forefront of both industry disruption and economic growth, in developed and developing markets alike, entrepreneurs and SMEs are critical in today's new ecosystem. They are an important source of economic growth, job creation and innovation – and we need to improve and strengthen our cooperation with them.



The seventh World Telecommunication Development Conference (WTDC-17) of the International Telecommunication Union (ITU) held in October 2017 in Buenos Aires, Argentina, gave ITU membership the opportunity to debate the latest trends in telecommunication/ICT development and to establish the priorities of the ITU Telecommunication Development Sector (ITU-D) for the next 4 years. The priorities of the 43 countries in ITU's Europe region were discussed and agreed in the form of five Europe regional initiatives. The regional initiative on "ICT-Centric innovation ecosystems" aims at enhancing entrepreneurship and establishing a sustainable culture of innovation through concrete strategic actions using ICT as an enabler and building on the existing regional initiative in Europe on entrepreneurship, innovation and youth. The regional initiative is a clear indication of the importance of innovation in the Europe region.

This report provides an overview of the many good practices in Europe- from start-ups, government, academia, financing entities and more- to accelerate digital transformation, which may serve as basis for better policies in countries where gaps have been identified. Replicating and amplifying such practices can strengthen the innovation ecosystems of countries and help them achieve the 2030 Agenda for Sustainable Development.

A handwritten signature in blue ink, appearing to read 'Brahima Sanou'.

Brahima Sanou,

Director, Telecommunication Development Bureau

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Executive summary

ITU innovation research shows that there is a growing digital innovation divide in many countries, and that ICT-centric innovation ecosystems have a critical role to play in fostering digital transformation that leads to economic inclusion, positive externalities and sustainable growth for communities, cities and countries. Even though many European countries have good rankings on the Global Innovation Index, a look at ICT innovation success stories shows that results do not match expectations.

Europe faces many challenges: talent flight, ensuring start-up triumphs, and technological and intellectual property leakages to leading ecosystems like Silicon Valley in the United States of America. However, Europe also offers many good practices that can be used to accelerate digital transformation and as a basis for better policies in countries where gaps have been identified. By replicating and amplifying good practices in Europe, countries can strengthen their innovation ecosystems and become innovation leaders. It is therefore imperative to share regional and global knowledge, expertise and experience in strengthening ICT innovation ecosystems in the European context.

This report offers an overview of the challenges and opportunities inherent in accelerating digital transformation in Europe. It provides an understanding of the critical enablers and linkages needed to foster ICT innovation in Europe, and examines good practices in the European context that can serve as a basis for strengthening digital innovation ecosystems. It also aims to promote international cooperation and partnership in building ICT-centric innovation ecosystems.

In an increasingly open global economy, technological solutions can propagate very quickly to bring much-needed remedies to markets – or they can falter because the underlying ICT ecosystems lack critical enablers to translate technology into appropriate market solutions. Innovation is a systems issue, and understanding digital transformation capabilities and linkages within this system is key to building vibrant and competitive innovation ecosystems. To function optimally, the system needs good practices that foster the development of strong ecosystems capable of leveraging the economic and social opportunities provided by ICTs and telecommunication technologies.

World leaders and countries have embarked on the 2030 Agenda for Sustainable Development, but a major effort will be needed to accelerate achievement of the related Sustainable Development Goals. Two SDGs are essential to ensure that all the SDGs have a sustainable impact. SDG 9 aims to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation, while SDG 17 aims to strengthen the means of implementation and to revitalize the global partnership for sustainable development. International cooperation in sharing good practices, connecting various ecosystems, and nurturing innovation and entrepreneurship is therefore urgently needed.

This report is divided into three parts:

The introduction provides an overview of the importance of innovation and basic background information about ITU's role; it also introduces a common language on innovation and its challenges. The growing digital innovation divide is briefly discussed in the context of ITU's work to help countries undertake comparative assessments. The introduction ends by stressing the imperative need to strengthen digital innovation ecosystems in Europe.

Section 2, on accelerating digital transformation, provides a new understanding of digital transformation capabilities and examines the key building blocks needed to accelerate transformation: guiding innovation dynamics, building innovation capacity, and integrating ICT innovation into key sectors. It explores why these enablers may not deliver optimal results in some cases, and brings forward critical elements to explore in order to address issues. This concept of key enablers provides the foundation for reviewing and distinguishing good practices from Europe.

Section 3, on good practices in the European context, provides selected examples drawn from initiatives in the region. Each of the practices discussed is qualified as a good practice in its context – on the grounds that it serves as an example for how an existing barrier has been successfully addressed – that holds the potential to be turned into a working best practice

in a different context. Section 3 shares insights on initiatives that various stakeholders have undertaken to make their environment perform more competitively.

In short, this report identifies a set of practices that drive digital transformation and can serve as a basis for assessing the capabilities of ICT-centric ecosystems in Europe. Learning from European good practices, benchmarking to understand the latest developments in supporting research, development and innovation – these are important steps towards accelerated economic growth and achievement of the SDGs, particularly SDGs 9 and 17. Given the limited scope and scale of this report, the comprehensive identification and review of best practices in European innovation ecosystems in terms of the critical enablers identified – guiding innovation dynamics, building innovation capacity, and integrating ICT innovation into key sectors – will require further work.

Although many research reports exist on innovation systems at the macro level, there has been very little research – and especially very few comprehensive analyses – on ICT-centric innovation systems. Using a comprehensive framework that can provide comparable measurements to evaluate and understand the dynamics of an ICT innovation ecosystem, ITU has developed a knowledge base for assessing, comparing and making recommendations to strengthen ICT-centric innovation ecosystems. A database of good practices – such as the ones highlighted in this report – forms part of this body of knowledge.

The ITU Innovation Platform for Accelerated Digital Transformation focuses on multi-stakeholder and cross-sector engagement, in order to create vibrant ICT-centric innovation ecosystems and to develop digital innovation capabilities that will accelerate digital transformation.

Box 1 - Accelerating digital transformation through ITU's Innovation Platform

"How do we get started, and how do we know we are heading in the right direction?"

These are the questions ITU members often ask as they embark on programmes to transform their ICT infrastructure into the innovative powerhouse it could and indeed should be – one that will drive outstanding economic growth and place them squarely at the centre of twenty-first-century digital opportunity. While the questions can appear daunting, there is a solution – and a step-by-step process that leads the way.

Through the range of powerful products, services and tools making up the ITU Innovation Platform, ITU helps its members foster vibrant ICT-centric innovation ecosystems and accelerate digital transformation for sustainable growth in the digital economy. The goal is to place ICT innovation front and centre in a country's national development planning.

The ITU Innovation Platform offers four powerful elements:

- Digital Innovation Framework: a scalable approach mapping enablers and blockers in potentially vibrant ICT centric ecosystems and assessing a country's capabilities for progressing towards an accelerated digital transformation.
- Country Assessments: powerful high-value analyses of a country's digital ecosystems and its potential for digital transformation.
- Co-development of country-level bankable projects.
- Knowledge-sharing and capacity building: including dialogues on innovation at regional and global level – and scaling of work through national and regional capacity building.

The main conclusion of this report is the need to foster international cooperation and global partnership on strengthening digital innovation ecosystems, at both the regional and global levels. ICT-centric innovation ecosystems are key to development in this age of fast-changing technologies. Without

urgent action on building and strengthening ICT-centric innovation ecosystems, many technologies will fail to produce appropriate solutions for addressing market needs and developing ICT-enabled industries, and this will ultimately inhibit national competitiveness and global prosperity.

1 Introduction

1.1 Background

ICTs and telecommunication technology are evolving incredibly fast, from 3D printing to the Internet of Things, mobile everything (money, services, etc.), social networks, and more. These changes are driven by digital innovation, and countries, cities and communities need to navigate them to achieve sustainable economic growth.

Innovation is essential to address local and global problems, to enable innovators to create competitive solutions and sustainable employment, to give entrepreneurs and companies the incentives to develop their own communities and cities, and to ensure that the public sector has the means to accelerate its transformation.

BDT's main aim is to enhance telecommunication development by offering, organizing, facilitating and coordinating delivery of technical assistance, as well as the implementation of projects. To that end, and having been given a strengthened mandate for innovation by WTDC-17, BDT has been assisting Member States to develop their ICT-centric innovation ecosystems and foster the uptake of digital entrepreneurship and the development ICT-enabled industries.

WTDC-17 also adopted the Regional Initiative for Europe on ICT-centric innovation ecosystems. The objective of this new regional initiative is to enhance entrepreneurship and establish a sustainable culture of innovation by taking concrete strategic action using ICT as an enabler.

ITU has been working closely with its partners and members, bringing together technology and innovation to create synergies which will take them further and faster towards achieving the SDGs, especially SDG 9 (Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation).

1.2 Common language on innovation

Innovation is a complex, often used (and misused) concept.

Box 2 - A common definition of innovation

This report uses the OECD definition of innovation:

“An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.”¹

ICT affects business models, mindsets, organizational structures, R&D, markets and networks, contributing significantly to GDP growth. ICT-centric innovation can thus have a significant impact on development.

¹ OECD, *The Measurement of Scientific and Technological Activities: Guidelines for Collecting and Interpreting Innovation Data: Oslo Manual*, 3rd edition, prepared by the Working Party of National Experts on Scientific and Technology Indicators, OECD, Paris, 2005, para. 146.

In the early days of academic research on innovation, stimulating innovation was thought to be a linear process: science produces technology and technology delivers products and services in response to market needs. This led to the idea that increased investment in innovation inputs such as R&D would yield more innovation. Unfortunately, this perspective does not reflect the dynamism of the innovation process, which comprises a variety of interacting factors, such as R&D investment, but also talent pools, culture, economic conditions, markets and investment, among many others.

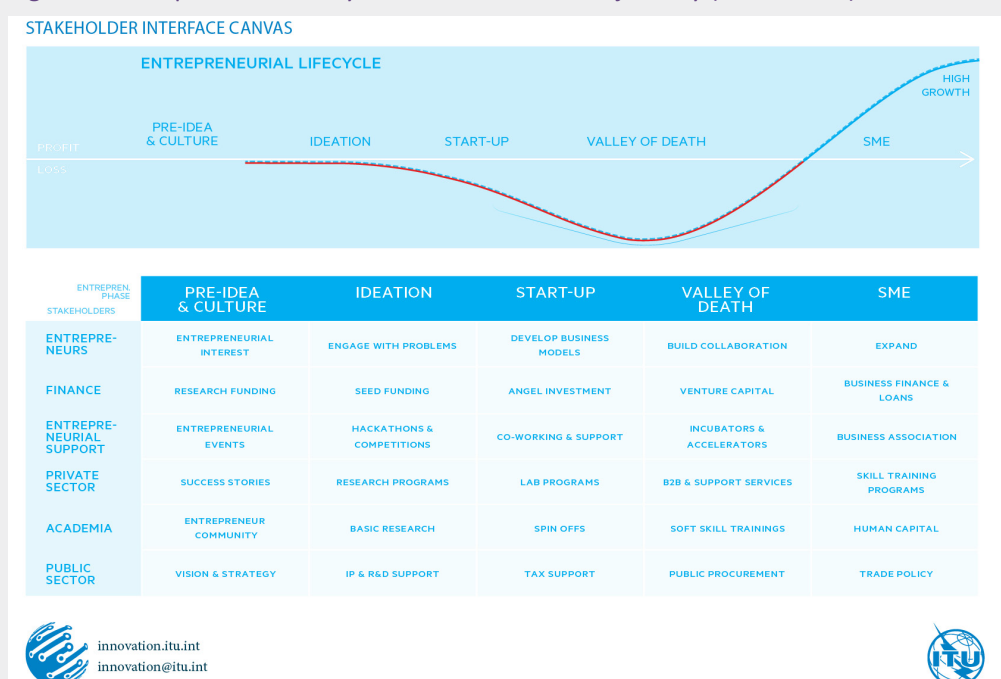
As a result, a new school of thought has emerged that considers innovation production from a “systems” perspective. In this model, innovation does not have a singular direction nor is fostering it simply a matter of increasing investment in research. It is a complex process incorporating investment, education, networking, community building, cultural change, economic factors and serendipity. Perhaps most importantly, it illustrates how those who stimulate interaction between science, technology, institutions, learning and public policy generate knowledge. In other words, the systems approach shows how innovation is driven by stakeholders who know the overall process and their roles, and how those roles relate to those of other stakeholders.

Box 3 - Understanding the entrepreneurial lifecycle and the innovation journey

Figure 1 below depicts the lifecycle of an innovation or business through pre-ideation, ideation, start-up, the valley of death (the high risk period between the launch of a company and when it becomes financially sustainable), transformation into an SME, and finally, scaling and exiting.

At each stage of this journey, stakeholders in the innovation ecosystem have a role to play, from the entrepreneurs taking the journey and the government, which must create a favourable environment, to the private sector, the support networks, and the finance or academic groups. A full definition of these groups can be found in the ITU policy toolkit, Bridging the Digital Innovation Divide¹.

Figure 1: Entrepreneurial lifecycle and the innovation journey (Source: ITU)



¹ Available at https://www.itu.int/en/ITU-D/Innovation/Documents/Publications/Policy_Toolkit-Innovation_D012A0000D13301PDFE.pdf.

1.3 ITU's Digital Innovation Framework

In 2016, ITU launched the first country review of an ICT-centric innovation ecosystem, for Albania¹. This led to additional innovation research worldwide, to understand and develop a scalable framework for fostering ICT-centric innovation ecosystems.

ITU innovation research, conducted with over 300 national stakeholders worldwide and over 200 organizations in several countries, has shown that systemic challenges in ICT-centric innovation ecosystems are responsible for gaps in access to, and use and availability of, appropriate technology solutions. This growing digital innovation divide requires a holistic framework to understand and solve issues

¹ The report is available at <https://www.itu.int/en/ITU-D/Innovation/Documents/Publications/Albania%20Country%20Review%20Innovation%20June%202016.pdf>.

with ICT innovation ecosystems. Without such a framework, many investments in ICT ecosystems will be unsustainable and have no impact.

In 2017, ITU developed the Digital Innovation Framework, which enables countries to map key challenges and opportunities in their ICT innovation ecosystems and assists stakeholders through their innovation journey. Launched in a publication entitled *Bridging the digital innovation divide: a toolkit for strengthening innovation ecosystems*,² the Digital Innovation Framework offers comparable measurements to actively foster vibrant innovation ecosystems, and so nurture digital transformation for sustainable growth.

ITU worked with other international organizations, global experts and key stakeholders to develop this toolkit, the ultimate goal being to close the innovation divide that separates those developing and using emerging technologies from those who, at best, are reliant on others to develop solutions, and at worst, do not benefit from access to innovation in ICTs.

Box 4 - Selected ecosystem maps using ITU's Digital Innovation Framework

The innovation journey map sets out at a glance 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 each stakeholder's role in support of entrepreneurs and innovators at each stage of the lifecycle. The colour coding identifies areas which are well supported (green), inadequately supported (yellow), or missing or weakly supported (red).

To illustrate differences in ecosystem vibrancy, the case of two ecosystems are presented through their innovation journey maps.

Case 1

"Young people have some talents, they have energy. But it will burn out soon if that energy is not guided or supported to help build good companies." *An ecosystem stakeholder*

In this case, the map shows that, despite having a strong vision, the country lacks clear guidance for innovation activities, has insufficient innovation infrastructure and has failed to integrate innovation into economic activities.

Figure 2: Low-income country – innovation journey map

Entrepreneurship Phase	Pre-Idea	Ideation	Startup	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 & Loans
Entrepreneurial Support	Entrepreneurial Events	Hackathons & Competitions	Co-working & Support	Incubators & Accelerators	Business Association
Private Sector	Success Stories	Research Programs	Lab programs	B2B & Support Services	Skill Training Programs
Academia	Entrepreneur Community	Basic Research	Spin Offs	Soft skill trainings	Human capital
Public Sector	Vision & Strategy	IP & R&D Support	Tax Support	Public Procurement	Trade Policy

Source: ITU.

² See note 2 above.

Case 2

"People run in different directions, there is no common strategy to my knowledge."

An ecosystem stakeholder

In this case, the map spotlights areas in which there are challenges, such as guiding innovation dynamics, specific policies such as funding and R&D, and public-private partnerships.

Figure 3: Middle-income country – innovation journey map

Entrepreneurship Phase	Pre-Idea	Ideation	Startup	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 & Loans
Entrepreneurial Support	Entrepreneurial Events	Hackathons & Competitions	Co-working & Support	Incubators & Accelerators	Business Association
Private Sector	Success Stories	Research Programs	Lab programs	B2B & Support Services	Skill Training Programs
Academia	Entrepreneur Community	Basic Research	Spin Offs	Soft skill trainings	Human capital
Public Sector	Vision & Strategy	IP & R&D Support	Tax Support	Public Procurement	Trade Policy

Source: ITU.

1.4 Need for good practices

Technological innovation – invention, commercialization, widespread adoption and use – is one of the most powerful drivers of wealth and increased well-being in the digital age. Countries and regions that have less-developed innovation capabilities require assistance in their efforts to catch up, and leading innovators must be supported to continue to grow sustainably. It is of great importance for policy-makers, senior executives and entrepreneurial leaders to receive evidence-based guidance on the design of innovation-focused policies and programmes in their organizations, local regions and nations.

Using ITU's Digital Innovation Framework, stakeholders can obtain comparable measurements of ICT innovation capabilities in any ecosystem, city or country in Europe or elsewhere in the world. For every ecosystem assessed, however, good practices and those to be avoided must be identified.

Irrespective of where the gaps and opportunities are, the key players in an ecosystem can isolate good practices that should be shared and replicated, and look for international good practices that can serve as a model for addressing issues. ITU has developed a database of good practices for use in this process. Sharing knowledge of good practices is essential for innovation ecosystems.

The good practices are categorized based on ITU-developed frameworks and terminologies. Ensuring a common language on building ICT-centric innovation ecosystems is essential to foster innovation and entrepreneurship across Europe.

1.5 Imperatives for a stronger regional ICT-centric innovation ecosystem

The world is moving towards a knowledge-based economy where knowledge will be the main economic asset. ICT-centric innovation will be an essential aspect of staying competitive.

European countries are well positioned in the Global Innovation Index 2017,³ with eight of the top 10 countries being in Europe. The overall picture painted by European Commission data is nonetheless very different. The European Union lags behind the United States and Asia when it comes to innovation and entrepreneurship – and European Commission data confirm this. Europe was home to just 16 unicorns⁴ in January 2017, compared to 91 in the United States and 44 in Asia. In 2006, 17 of the world's 50 most valuable companies were from the European Union; today only six are.

According to a public opinion poll conducted by the European Commission:⁵

- 45% of Europeans say it has never crossed their mind to start a business;
- 79% of Europeans say it is difficult to start a business owing to the lack of financial support; and
- 69% of companies do not achieve an unbroken record of revenue growth in years 2 to 5 of their existence.

Public sector leadership in Europe is acutely aware of the need to foster innovation-driven entrepreneurship, and a large number of relevant priorities are already on the policy agenda. There are many interventions targeted at gearing education towards the needs of entrepreneurial careers, improving access to finance, enhancing the availability of and access to relevant talent, and creating better conditions for cross-stakeholder or cross-regional collaboration between different players.

There is very little coordination between countries on innovation policies, and often best practices are not shared across borders. This siloed approach to innovation curtails the prospects for scaling the beneficial effects worldwide.

European companies received on average just EUR 1.3 million from venture capital funds, compared to EUR 6.4 million in the United States. Only 5% of venture capital-backed EU companies obtain venture debt financing, compared to 15 to 20% in the United States and 8 to 10% in the United Kingdom. Business angels invested in half the number of businesses in Europe compared to the United States.⁶

Out of 276 regions within the European Union, only about 10% could be considered as driving innovation and benefitting from substantial funding simultaneously.⁷ In fact, many studies and data show that the innovation divide or "gap" between EU regions has been growing.

Europe continues to bleed technological know-how and intellectual property to the United States. Companies in the United States account for nearly half of all buy-outs of European start-ups. Although this may seem to be of minor relevance in a globalized world, it is actually very important, because entire new areas of emerging technology are at risk of leaking out of Europe, to be developed in and benefit better performing ecosystems like Silicon Valley in the United States. Concrete measures could prevent these critical leakages in innovation.

Since the 1990s, there has been a decline in productivity growth in Europe. Some experts explain this as premature de-industrialization.⁸ Strict liability rules, data portability and access to data all have an impact on innovation because they can slow interoperability and inhibit innovators from transforming the value chains of non-ICT sectors. The keys to addressing these problems are balancing public interest (customer protection) and market force in a way that will drive innovation, public-private partnerships, and international harmonization of regulations.

³ See <https://www.globalinnovationindex.org/gii-2017-report>.

⁴ A unicorn is a start-up valued at more than USD 1 billion.

⁵ See http://ec.europa.eu/commfrontoffice/publicopinion/flash/fl_283_en.pdf.

⁶ See <http://cor.europa.eu/en/events/Documents/closing-the-innovation-divide-concept-note.pdf>.

⁷ See note 8 above.

⁸ See http://www.itu.int/en/ITU-D/Innovation/Documents/Documents_Events_Presentations/2017_WSIS/MON_WSIS17/02%20Paolo%20Casini_European%20Commission.pdf.

1.6 The opportunities ahead in Europe

Many young people in Europe (according to European Commission data, nearly half of those between 18 and 24) hope to start their own businesses. To counter and prevent talent and technology drains, Europe needs to be more active in adopting measures to develop competitive digital innovation infrastructure, improve integration of key sectors, and provide better guidance for innovation activities, including related policies in support of innovation and entrepreneurship.

European ecosystems have many strengths compared to Silicon Valley. Europe has highly skilled people and lower wages. The European Union has a potential market of 510 million customers, but European entrepreneurs cannot take full advantage of that potential. This is in part related to fragmentation on the supply and demand sides of risk financing across the various Member State jurisdictions. Entrepreneurs struggle to scale up their businesses because of fragmentation in standards, legal frameworks and insolvency laws. The providers of risk capital suffer from market fragmentation as well. In general, Europe has a shortage of risk capital for small, early-stage growing businesses.⁹

The smart use of ICTs for SMEs¹⁰ is seen as an opportunity in Europe. It encompasses, for example, initiatives to build integration platforms supporting B2B services in key sectors such as tourism and agriculture – a step in the right direction in terms of digitization of processes, but one that is insufficient, as value chains are being re-invented by new entrants from global ecosystems like Airbnb, which are disrupting the tourism sector.¹¹ The sector's digital transformation requires rethinking – from building integration platforms to nurturing an enabling environment that can absorb emerging technology. By strengthening digital innovation ecosystems, innovators in Europe will be better able to transform key sectors through technology, and thus compete on a level playing field with their Silicon Valley counterparts.

To benefit from current opportunities and address challenges, it is important to review the sustainability and competitiveness of European ecosystems, and to promote a strong regional ecosystem that fosters digital transformation across Europe.

⁹ See <https://www.afme.eu/globalassets/downloads/publications/afme-highgrowth-2017.pdf>

¹⁰ See https://ec.europa.eu/growth/industry/policy/digital-transformation/smart-use-ict-smes_en

¹¹ See <http://fortune.com/2016/11/17/airbnb-experiences-trips/>

2 Accelerating digital transformation

To address the growing digital innovation divide, the actions of all stakeholders in the ICT innovation ecosystem in supporting innovation and entrepreneurship need to be understood – from research through to start-up formation and the creation of jobs by SMEs, culminating in the existence of high-growth firms in an economy.

Before exploring how to accelerate digital transformation, it is critical to generate a common understanding about the relationship between an innovation ecosystem, its stakeholders and digital transformation.

2.1 Understanding digital transformation capabilities

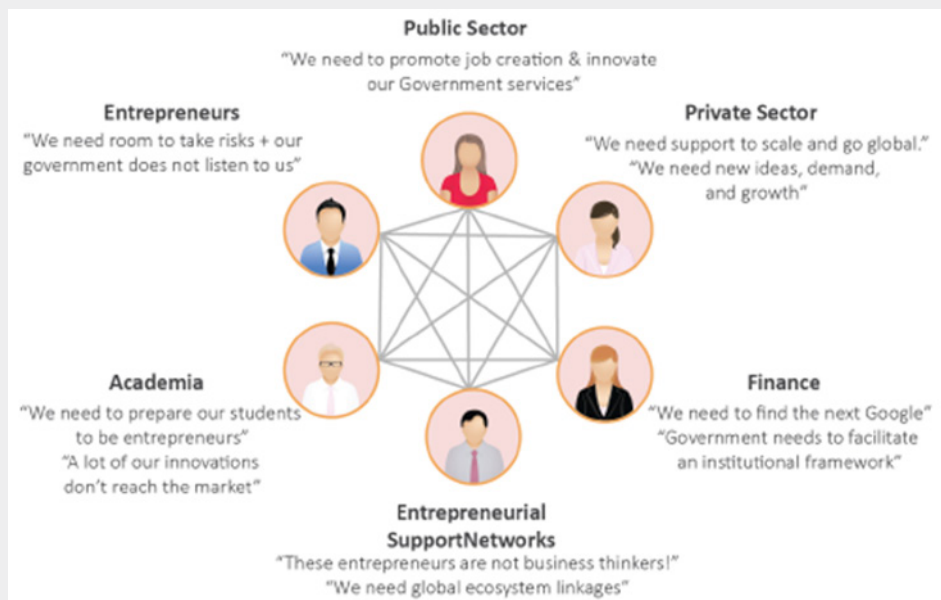
Digital transformation is what happens when innovation is applied to solve problems through the use of ICT/telecommunication technology. The benefits to a country and its people are immense: significantly increased productivity, economic growth and greater employment opportunities. The degree to which these benefits are within reach depends on the vibrancy of the ICT-centric ecosystem and the long-term vision and strategy supporting it.

All stakeholders in the ecosystem need to understand their potential to make a difference, as well as their very real capabilities, as they engage in transformation.

Box 5 - What are the ecosystem stakeholder groups?

ITU's Digital Innovation Framework identifies six main stakeholder groups needed in digital transformation: entrepreneurs, the public sector, financiers, academics, the private sector and entrepreneurial support networks.

Figure 4: Ecosystem stakeholder groups: The six stakeholder groups are shown with the linkages between them and quotes indicating their goals or needs in the innovation ecosystem



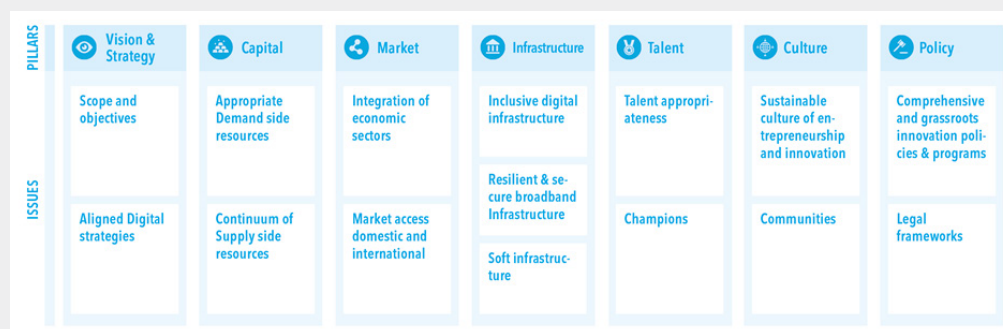
Source: ITU.

ITU's Digital Innovation Framework defines the seven critical pillars of an innovation ecosystem: vision and strategy, capital, market, infrastructure, talent, culture and policy. They need to be assessed to obtain a comprehensive view of the system's performance.

Understanding the issues pertaining to each pillar through the lens of the stakeholders' journey helps identify the opportunities of, and barriers to, digital transformation.

Box 6 - Digital transformation: Opportunities and barriers

Figure 5: Digital transformation: Opportunities and barriers



Key factors and components that enhance, foster and facilitate digital transformation are clearly clustered and helpfully organized in the diagram above.

Source: ITU.

The ITU Digital Innovation Framework not only helps transfer this understanding, it also clearly sets out what enablers can achieve, as well as identifying the barriers they will encounter along the journey of change.

Once a common understanding has been reached of the relationship between innovation and digital transformation, the stakeholders and their roles, one key question remains: "What are the core challenges in digital transformation?"

2.2 Core challenges in digital transformation

ITU innovation research has shown that there are many barriers to digital transformation, notably:

- lack of coordination or of mechanisms to develop contextual and relevant policies supporting digital innovation and entrepreneurship;
- unclear roles or engagement of stakeholders in developing their innovation ecosystem;
- missing innovation capabilities, especially soft infrastructure;
- suboptimal integration of innovation ecosystems into key sectors of the economy; and
- the impact of the fast-changing ICT/telecommunication environment.

The innovation ecosystem needs to be thoroughly analysed to determine what should be done to identify the challenges and unleash the opportunities. To properly navigate the changing environment, countries need to constantly analyse needs and respond with appropriate programmes and policies. In an innovation ecosystem, entrepreneurs and innovators need many policies, initiatives and specific support programmes to ensure the success of start-ups and SMEs. In many countries, however,

the institutional capacity to adjust policies and programmes to the needs of the digital innovation ecosystem may lag slightly behind.

ITU innovation research shows that different countries have different innovation capabilities in terms of digital innovation infrastructure. The same logic applies to cities and other locations. Innovation capabilities need to be available countrywide in order to ensure inclusive development. Soft innovation capacity is needed throughout the ecosystem. Also known as soft infrastructure, soft innovation capacity consists of programmes and resources – tech hubs/tech parks, training resources and research institutions – that provide mentorship, skills, experience and other knowledge resources to support innovative businesses.

Additionally, the key ingredients for an innovation journey, such as access to finance, talent, markets, networks, infrastructure and support institutions, should be distributed and available in the country's various regions, provinces or economic clusters. This is important because every community or city has a specific comparative advantage that may require enhanced integration with the work of its corresponding innovation ecosystem.

In today's changing environment, many organizations and communities are experiencing a paradigm shift in terms of the need to have access to flexible and adaptive resources and capabilities. With ICT/telecommunications, economies are hyperconnected and there is only one global innovation ecosystem. Shaping innovation ecosystems will also require a shift in mindset on the part of stakeholders, who have to adapt to these changes.

Traditional organizational structures are still built on a centralized model (command and control); they offer benefits but also disadvantages (owing to their inherent potential to create silos in the markets and communities they serve). Existing innovation agencies in many countries are still structured using these twentieth-century approaches, which often do not meet the needs of emergent behaviours in the global ecosystem. They tend not to be flexible, connected or adaptive to the changing global ecosystem.

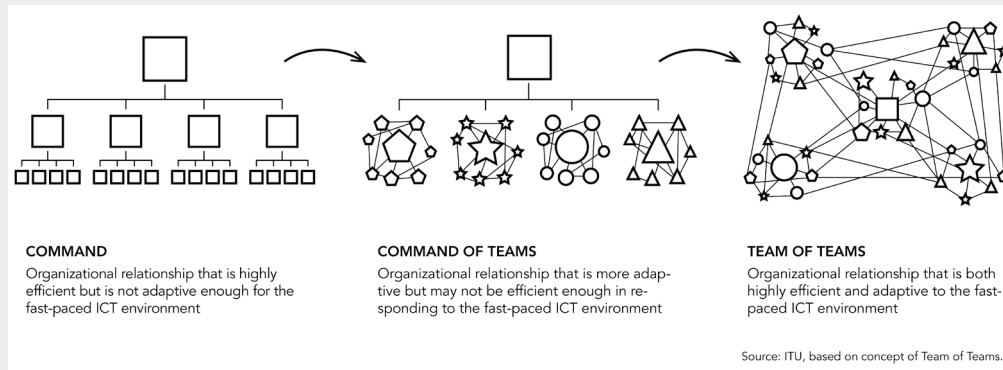
As a result, ICT is often seen as a sector on its own, with its own coordination mechanisms and independent stakeholders – and not as the cross-sectoral enabler it is. Sector-focused policies, whether they relate to finance, education or infrastructure, should therefore complement ICT policies. In today's fast-changing ICT/telecommunication environment, innovation agencies need to have access to flexible resources, be ICT/telecommunication-focused, and develop open innovation capabilities in key sectors.

One key implication in this context is that traditional innovation agencies, among others, need to be reinvented to meet the needs of digital innovation ecosystems. Alternatively, new, flexible agencies are needed to meet vibrant ecosystem needs.

Box 7 - Mega trend: from command and control to adaptive

In the graph below, the model 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 on the part of stakeholders and their institutions.

Figure 6: Command and control vs. self-managed team of teams



Source: 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.

Once the opportunities in, and barriers to, digital transformation are understood, the question is: “How do we accelerate digital transformation by developing the specific capabilities needed?”

At WSIS 2017, ITU engaged in innovation dialogues¹² with global experts to obtain a shared understanding of how to accelerate digital transformation around three key building blocks: guiding innovation dynamics, building ICT innovation capacity, and integrating key sectors of an economy in order to foster sustainable ICT-enabled industries.

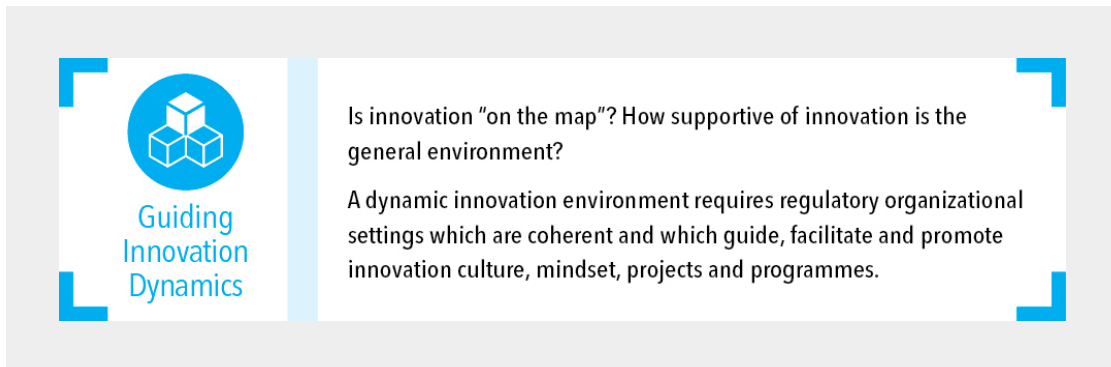
Box 8 - Key building blocks for accelerating digital transformation



¹² For further information, go to <https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Pages/Events/2017/WSIS/Innovation-Dialogues-to-Accelerate-Digital-Transformation.aspx>.

Each building block requires a continuum of services, initiatives and institutions to meet its goals. To achieve vibrant innovation ecosystems, stakeholders therefore have to engage in delivering these services and initiatives, and nurturing supportive institutional frameworks.

2.3 Guiding innovation dynamics



Is innovation "on the map"? How supportive of innovation is the general environment?

A dynamic innovation environment requires regulatory organizational settings which are coherent and which guide, facilitate and promote innovation culture, mindset, projects and programmes.

The development of 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. The right ecosystem can be both an inspiration for innovation and a source of competitive advantage. Ecosystems nevertheless need guidance, which requires the development of a suitable business environment, innovation readiness and entrepreneurs nurtured to develop appropriate technology solutions.

The creation of a favourable business environment requires a digital transformation roadmap with a clear vision and strategies, and the development of key initiatives. The environment must be dynamic and able to change in response to its stakeholders' new needs.

Box 9 - Fostering a dynamic business environment

- In the case of Poland, the development strategy had five pillars: reindustrialization, the development of innovative companies, increased savings, foreign expansion, and sustainable social and regional development.
- Poland ranks third country when it comes to unmanned aerial vehicle operators [after the United States and Japan]. The Government of Poland helped start-ups do roadshows; now it wants to scale up and cut government funding, while keeping the focus on specialized products via R&D.

Source: WSIS 2017, innovation track@WSIS, guiding innovation.

Achieving innovation readiness often requires a change in enabling policies, regulations, and rules balancing the old analog and the new digital economy. Once again, the key to innovation guidance is the ability to nurture the right environment without restricting its growth.

Box 10 - Improving innovation readiness

- The key to guiding innovation is balancing public interest/customer protection and market force in a way that that will drive innovation, public-private partnerships and international harmonization of regulation.
- Certain policies, such as reducing the cost of investment and fiscal and financial policies to attract international start-ups, have prompted many organizations to choose Lisbon or Porto as their headquarters.
- Start-up policy for growth should include tax incentives.
- Regarding the development of non-financial applications of blockchain technology, the European Commission is establishing an inventory of what exists but has not drafted regulations, which it would be premature to do at this stage.
- Big data has huge potential, but poses problems in terms of regulation and privacy. The solution may be: "Open algorithms, rather than open data." Building trust is key when sharing data.

Source: Guiding innovation, innovation track@WSIS, WSIS 2017.

Nurturing entrepreneurs to develop appropriate technology solutions means fostering start-ups. The dynamics of start-ups in an economy's technology sectors is an important indicator of technological performance. To catalyse the entrepreneurial ecosystem, which consists 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 guidance should allow support for innovation through all stages – from working on the right problem, to getting the right education and providing funding – so as to start as well as grow innovative businesses.

Without proper guidance, innovation ecosystems can falter. Europe has seen many of its technology giants fall under the impact of stronger ecosystems, especially Silicon Valley. Winning competitively through economies of scale, it turns out, is not just for the manufacturing sector. In globally connected ecosystems, and open economies, only the strongest innovation will dominate the value chains.

Guiding innovation is therefore very contextual. It requires a guiding innovation agency or organization and flexible approaches that deliberately understand and set policies and programmes fostering digital innovation and entrepreneurship. The current siloed approaches are detrimental to vibrant and competitive digital innovation ecosystems.

2.4 Building ICT innovation capacity



Is there an innovation infrastructure?

Is that infrastructure sufficiently well developed? Is it the right infrastructure to enable the ecosystem to grow sustainably? Does the infrastructure support, encourage and inspire innovation?

Exposure to environments that encourage innovation is important, as such environments provide both inspiration and support. 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 can meet.

Historically, work environments of this kind existed in well-funded university research labs or inside companies; over time, however, they have evolved into the open innovation model.¹³ Open innovation allows organizations to create and capture value more effectively, and offers adaptive platforms on which firms can innovate while increasing their productivity. With emerging values coming from a globally connected ecosystem, open innovation platforms are becoming essential for competitiveness. Technology absorption is nevertheless a growing concern for many ecosystems.

Box 11 - Collaboration requirements for open innovation

In an open innovation model, the collaborative work of the ecosystem can be done in any location. With ICT/telecommunications, these spaces can be virtual as well as physical. The proliferation of technology platforms, with their ecosystems of developers, solution integrators, and partners, is considerably reducing the cost of innovation for entrepreneurs and innovators.

At the same time, these platforms present challenges for weaker ecosystems that cannot leverage them. For example:

- many education systems have inflexible curricula, and future innovators are not exposed to the latest trends allowing them to be productive in a global ecosystem;
- graduates lack the required skills and know-how, and have to undergo considerable retraining before they can be hired.

Source: ITU innovation research.

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 infrastructures are essential for building an ecosystem's innovation capacity, and are usually clustered around institutions of higher learning. The keys to their success are network density, linkages, cross-stakeholder collaboration and a problem-solving focus.

An important facet of public-private collaboration is exchange between universities and industry, 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 the development of technological innovations because they can offer various support mechanisms to nurture ideas to market and to adapt curricula, among other things. However, many universities are still operating as traditional organizations and not adapting fast enough to the changing environment. New partnerships and urgently renewed global partnerships are needed to accelerate their transformation into leading innovation centres.

¹³ See <https://corporateinnovation.berkeley.edu/open-innovation-research/>.

Box 12 - Digital innovation hubs and the future of work

“Digital innovation hubs are the future of work and our economy. It is both challenging, and interesting to bring (cross-sectoral) actors together. One should very much encourage this exchange & collaboration, and transfer knowledge and best practices in networks & innovation hubs.”

Ms Sunnie J. Groeneveld, Inspire 925, Switzerland

Source: Building ICT innovation capacity, innovation track@WSIS, WSIS 2017.

Experts¹⁴ on innovation ecosystems in general agree “that there are many different approaches to promoting the development of local innovation ecosystems and fostering entrepreneurship that creates new sectors and businesses”. It is not enough to provide simple innovation capacity, such as hubs and tech spaces. There is a need to push for greater collaboration and best-practice sharing in the context of global digital innovation ecosystems.

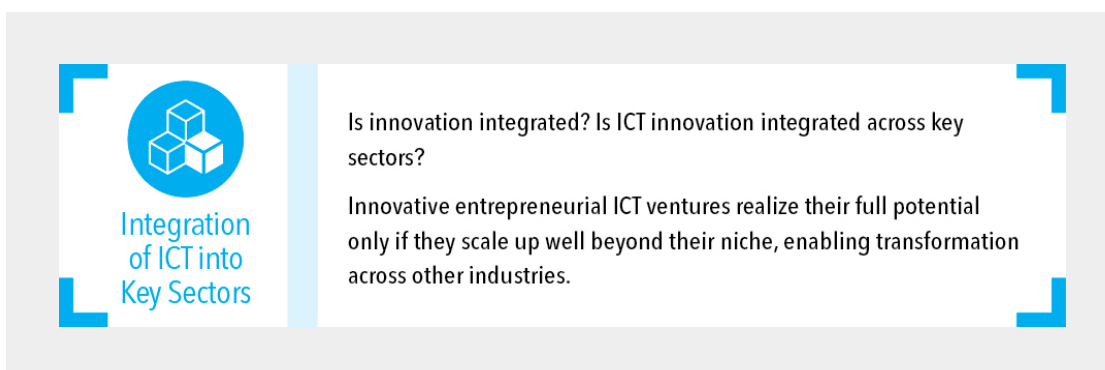
Box 13 - The secret recipe for building innovation capacity

- Networks and innovation hubs, cross-sector and cross-regional collaboration are key elements for building innovation capacity at the national and regional levels.
- To find the “secret recipe” for innovation and building innovation capacity, you need to turn to best practices, push for collaboration, and adopt a coherent strategy and vision across sectors.
- Cross-regional and cross-sector collaboration, and support for the establishment of innovation hubs and knowledge networks, are important.
- Experiments in building innovation capacity require cross-sectoral collaboration with higher education and a private sector perspective.
- Sharing the experience and best practices of universities in technology transfers can accelerate the delivery of innovation to markets.
- Universities have an anchoring role in providing entrepreneurial skills and nurturing a culture of innovation.
- One best practice for building innovation capacity is government-initiated accelerator programmes and cross-national knowledge exchange with talent attraction.
- Higher education needs to improve its capacity to provide skills that facilitate innovation and technical training.
- The world needs an ecosystem of universities, labs, companies, investors and regulators, all ready to collaborate and innovate.

Source: Building ICT innovation capacity, innovation track@WSIS, WSIS 2017.

¹⁴ For more information, go to <https://www.itu.int/net4/wsis/forum/2017/Agenda/Session/324>.

2.5 Integration of ICT innovation into key sectors



Integration of ICT into Key Sectors

Is innovation integrated? Is ICT innovation integrated across key sectors?

Innovative entrepreneurial ICT ventures realize their full potential only if they scale up well beyond their niche, enabling transformation across other industries.

Start-ups can scale organically through acquisitions or through collaboration. In the public sector, innovators need access to the demand that government services can offer. This demand helps the innovator obtain test references, validate the product, establish credibility and grow, and it satisfies government needs for accelerated public service transformation to meet citizens' needs. Moreover, the promotion of ICT services can help achieve a core development goal, by stimulating demand in e-government and services. Such services create much-needed demand from the public sector, place innovation on the national agenda, and lay the groundwork for digital transformation.

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

Stakeholder linkages and collaboration across multiple stakeholders are of great importance i.e. 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. If established players fail to embrace these approaches to collaboration, they will increasingly be unable to respond to competitive threats.

Box 14 - Rethinking roles in the development of key sectors

Many organizations with traditional products and services, such as in the advertising sector (with print adverts and newspaper) and tourism sector (with hotels and tours), have seen competitive threats from non-traditional players, especially new over-the-top (OTT) ICT firms such as Facebook and Airbnb. These new entrants are able to redefine value and customer experience using ICT innovation.

- Facebook and Google have helped re-invent the advertising industry.
- Airbnb has disrupted the hotel business and is now disrupting the tourism value chain with new products and services offering guided tours, restaurant bookings, etc.

No sector is untouched, and firms need to rethink their role and their competition to survive. Building open innovation ecosystems and platforms to fend off competitive threats is becoming the new norm in many industries.

The finance sector is currently facing threats not only from blockchain technology providers, but also from OTT providers such as WeChat, Facebook and others. Finance stakeholders need an active role where collaborative competition is the new norm.

Within sectors, many SMEs and big firms need to integrate technology more closely into their operations to be competitive and sustainable. In response, some established private sector firms are now developing B2B services that deliver value beyond their traditional products and services, in partnership with an open innovation ecosystem.

Innovation ecosystems are places where multiple stakeholders collaborate to support innovation and entrepreneurship, often around related clusters of economic activity. Initial efforts to use ICT/telecommunications to change specific sectors improved productivity in those clusters. Many initiatives still tend to push for connectivity, or simply efforts to move from analog processes to digital systems. But this is insufficient at a time when emerging players are redefining entire industries using ICT/telecommunication innovation.

Major changes are needed in the government and corporate concepts of innovation: a change in the internal approaches to innovation, and in the external relationships between traditional and non-traditional stakeholders and the environment. This will require profound transformation of value chains within and across industries. Competitive digital innovation ecosystems allow innovations to emerge in unconventional ways across governments and businesses by re-inventing their value chains.

Box 15 - Digital transformation and value chains

Recent economic theory defines a value chain as a set of activities (such as inbound logistics, production, distribution and consumption) that a firm in a specific industry performs in order to deliver products or services to its market.

- For the firm, leveraging ICT/telecommunication technologies will allow it to reinvent its value chain, an essential step for competitiveness and growth.
- A similar concept applies to an industry. By redesigning the value chains of individual firms and increasing innovation, an industry can stay competitive.

Although digitizing systems is a step towards digital transformation, it is of greater benefit to use technology that accelerates the reinvention of a firm or industry value chain. It is therefore important to avoid seeing technology as a root cause of change. Technology is an enabler, a tool. Misplaced expectations and the wrong vision can lead to wasted investment and missed goals.

The development of ICT-enabled industries with competitive clusters requires an ecosystem that helps businesses and governments transform by enhancing their ability to create and deliver value.

Source: ITU; M.E. Porter, *The Competitive Advantage: Creating and Sustaining Superior Performance*, Free Press, New York, 1985.

Preparedness for emerging technology is an important consideration for digital innovation ecosystems. Blockchain technology is transforming many industries, while 5G is offering new connectivity standards and new opportunities with the Internet of Things. E-commerce platforms continue to change distribution and consumption worldwide. Artificial intelligence and virtual reality have the potential to transform entire industries, for better or worse. Drones are changing the agricultural sector, building inspections and distribution systems.

Much remains to be done to heighten the impact of these technologies on specific sector transformation.

Emerging technological platforms are evolving fast, but many ecosystems may be left out if deliberate efforts are not made to ensure their absorption into key economic sectors. Much of the narrative today seems to be more about hype than reality. Many technologies falter because they lack governance and the initiatives needed to ensure they create market-appropriate solutions.

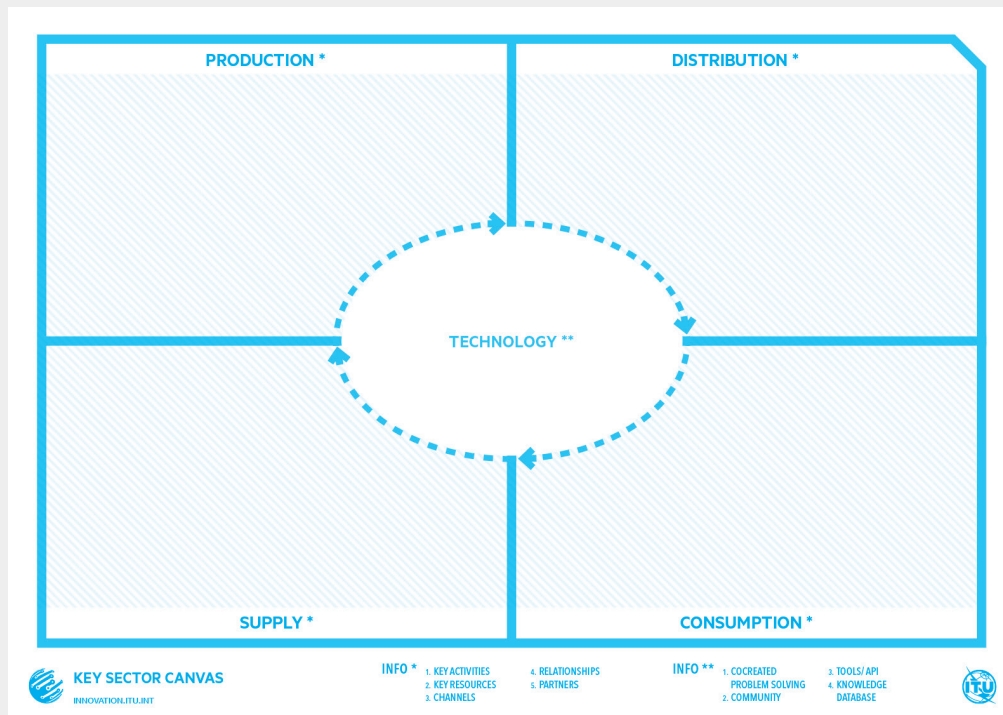
Box 16 - Diagnosing the impact of emerging technology on a sector

The ITU key sector canvas can help ecosystems assess the specific challenges and opportunities posed by emerging technology in a key sector. Based on its proven multi-stakeholder approach, and through co-creation, ITU can help diagnose and recommend specific flagship projects to develop a key sector.

Figure 7 depicts the ITU key sector development canvas, which serves as the basis for this analysis. The canvas reflects the key lesson that each sector value chain can leverage technology to solve specific problems.

Though structure processes, including user-centered design workshops and qualitative and quantitative interviews, ITU can help countries accelerate the integration of emerging ICT technologies into key sectors.

Figure 7: ITU canvas for key sector integration



Source: ITU.

To accelerate digital transformation, deliberate efforts must be made to integrate ICT innovation into key sectors of the economy while leveraging emerging technologies.

3 Good practices in Europe

This section captures some of the good practices in Europe that can provide insight for developing best practices in an ecosystem. The good practices are organized around the three key building blocks of strong innovation ecosystems: guiding innovation dynamics, building innovation capacity and integrating ICT innovation into key sectors. The list of practices is by no means comprehensive; it is intended to give the reader an overview of the various types of practice and their key characteristics.

Each of the practices described is qualified as a good practice in its context – based on the principle that it shows how an existing barrier has been successfully addressed within its environment – and has the potential to become a working best practice in a different context.

3.1 Guiding innovation dynamics

Guiding innovation dynamics can take several forms: from dedicated innovation agencies supporting the demand (market for innovation) and supply (access to resources, funds, incentives, etc.) sides of innovation, to initiatives aimed at solving challenges such as funding, supporting SME growth, policy issues, or simply fostering collaboration. Ecosystems need a comprehensive and contextual approach to effectively address the barriers faced in digital transformation. ITU's Digital Innovation Framework helps accomplish this first step.

The changing requirements of twenty-first-century organization and the need for new approaches were discussed earlier. Most existing innovation agencies were designed for the twentieth century and tend to focus on science and technology, and on the economy as a whole. Customized agencies are needed to address the changing requirements of today's environment and fulfil their critical role in an ICT innovation ecosystem. In a study of various innovation agencies worldwide,¹⁵ the innovation foundation NESTA developed an optimal model of innovation agency that can help orchestrate interventions for an ecosystem. Using NESTA's system-optimizing innovation agency model, innovation agencies can fulfil the following roles:

- orchestrate a combination of supply-side and demand-side innovation;
- take direct and indirect action to support the ecosystem;
- foster partnerships;
- coordinate across political and policy domains;
- develop a network of domestic and international experts.

Only a very few agencies focus exclusively on guiding ICT-centric innovation. This opens an opportunity for Europe to nurture such capabilities in existing agencies or to create new dedicated agencies to accelerate digital transformation.

A few examples of initiatives guiding innovation dynamics in Europe are given below. They can serve as a basis for developing best practices for other ecosystems and the national context.

TEKES (now Business Finland) – Finland

The overall objectives of TEKES – the Finnish national agency for innovation funding – include industry productivity and renewal, well-being of people and the environment, and capabilities for innovation activities (skills, networks, internationalization). TEKES provides proactive funding in line with overall strategic objectives and reactive funding based on customer demand. It is helping to increase the innovation-driven growth of SMEs and to promote the internationalization of Finnish R&D and its

¹⁵ See www.nesta.org.uk/sites/default/files/how_innovation_agencies_work.pdf.

access to global networks. In 2018, TEKES was fused with Finpro Oy (government-owned corporation for promotion of export), and is now operating under the name Business Finland.

Box 17 - TEKES/Business Finland – Finland



- TEKES provides R&D grants, R&D loans, and funding for young innovative enterprises and for strategic research.
- TEKES enjoys extensive independence as a government agency led by a director general and a board, which is regulated by legislation. In contrast, many R&D funding institutions in emerging economies are organizational subunits of ministries or other government bodies.
- TEKES-focused segments are start-ups and SMEs seeking growth from internationalization, and SMEs seeking growth in domestic markets.
- A proprietary, independent budget is the key to TEKES' strategic and operative flexibility. TEKES ensures multi-year project funding by allocating the full amount needed for the project's planned performance period internally, before the respective department takes a positive funding decision.
- TEKES constantly monitors and assesses the results and impact of the projects that it funds, through short- and long-term assessments, and external evaluations.
- Networks and innovation hubs, cross-sector and cross-regional collaboration are key elements for building innovation capacity at the national and regional levels, and promoting the anchoring role of higher education in creating a culture of innovation.

Sources:

<https://www.businessfinland.fi/>

http://www.isi.fraunhofer.de/isi-wAssets/docs/p/de/projektberichte/Final-Report_World-Bank.pdf

https://www.nesta.org.uk/sites/default/files/how_innovation_agencies_work.pdf

VINNOVA – Sweden

Vinnova is Sweden's national innovation agency. It works to promote sustainable growth by improving the conditions for innovation and funding needs-driven research. Vinnova operates with considerable autonomy and uses its strong industry ties to influence government innovation policy.

Box 18 - Vinnova – Sweden



- Vinnova invests 10% of its budget in grants for technology projects that develop cross-sectoral responses to major societal challenges in Sweden. It has spearheaded the development of "challenge-driven innovation", an approach which funds technology projects that develop cross-sectoral responses to major societal challenges (such as in the areas of health care, education and climate change).
- Vinnova's work is highly collaborative. Around 80% of its funding aims to be cross-sectoral and cross-disciplinary. In 2013, 44% of Vinnova's funds were spent on universities, 28% on private companies, and 15% on research institutes. Nearly 60% of Vinnova's funding for companies goes to SMEs. Vinnova designed a voucher programme to support SMEs that need access to new knowledge or technologies to test out innovative ideas.
- Vinnova commissions external consultancy firms to conduct interim and final evaluations of its programmes and runs follow-up studies on its investments, on the assumption that economic and systemic impact is best measured about five to seven years after completion of a specific project.
- Vinnova has supported more than 2 400 projects across a wide range of industries, investing just under EUR 300 million a year in a range of strategic initiatives. It received 60% more applications for its programmes in 2014 than 2012, suggesting an increased interest among Swedish businesses and researchers in doing innovative projects.

Sources:

<https://www.vinnova.se/>

https://www.nesta.org.uk/sites/default/files/how_innovation_agencies_work.pdf

ANI – Portugal

The Portuguese National Innovation Agency (ANI) promotes collaborative research projects in which companies and research organizations get together to develop innovative products and services. With a whole range of instruments available at European and national level, Portuguese companies do not lack options for funding, but the complexity of the procedures can be difficult to manage, especially for SMEs.

Box 19 - ANI – Portugal



- ANI offers integrated funding possibilities and helps companies navigate the instruments. The goal in many cases is to get R&D funding for companies from European Union institutions and then add national funding to bring the innovation to the market.
- ANI has developed national priorities for innovation funding based on the country's competitive advantages, such as energy, agro-technology, ICT and the blue economy. It has also set regional priorities in cases where regions have specific needs or assets.
- Through funding incentives, projects, international collaboration, innovation policies and advocacy, ANI delivers concentrated support for research.
- Compared to other innovation agencies, ANI's mandate is primarily to foster research funding.

Source: <http://ani.pt/en>

Startup Europe – European Commission

The Startup Europe programme aims to fund projects that help established start-ups and prospective tech entrepreneurs grow and achieve market success. It also raises awareness of high-potential innovators in Europe from EU-funded ICT projects.

Box 20 - Startup Europe – European Commission



- The goal is to connect start-up ecosystems in Europe.
- The aim is to reinforce ICT ecosystems for high-growth tech start-ups by interconnecting and creating new synergies between three or four different Startup hubs across Europe per project.
- Activities should focus on scaling-up of companies by connecting, across different entrepreneurial ecosystems, key relevant stakeholders such as tech entrepreneurs, mentors, corporations, customers, designers, the media, investors and local authorities.
- This and many other programmes are not open to all 43 countries in the ITU Europe Region.

Source: <http://startupeuropeclub.eu/about-us/>

UKE Innovation – Poland

UKE, the Office of Electronic Communication, is the national regulatory authority for the telecommunication and postal services market in Poland. One aim of UKE Innovation is to help foster an environment that stimulates collaboration between big companies, academia, government authorities and start-ups.

Box 21 - UKE Innovation – Poland



- UKE promotes Polish experiences and programmes supporting innovation through and at events.
- UKE fosters cooperation with business incubators and R&D departments.
- It continuously monitors the ICT industry to ensure that the regulatory environment is supportive of innovation, and takes initiatives to expand broadband and new technology in the country (such as 5G and fiber-to-the-home).
- UKE enables participation in government procurement and projects on innovation.
- It sponsors entrepreneurial events such as hackathons and competitions, which build a culture of innovation among young people and innovators.

Sources:

<http://en.archiwum.uke.gov.pl/from-strategy-to-implementation-uke-organises-workshop-during-wsis-forum-2017-22465>

Guiding innovation, innovation track@WSIS, WSIS 2017

INPUT Programme – Hungary

Hungary has launched a flagship start-up support programme for its ecosystem. The INPUT Programme aims to create or nurture internationally competitive Hungarian tech start-ups, and to facilitate the growth and transformation of the Hungarian start-up ecosystem by encouraging entrepreneurs and helping them build sustainable ventures.

Box 22 - INPUT Programme – Hungary



- The INPUT Programme was developed with contributions from the EU Regional Development Fund and the Hungarian Government.
- The programme works with stakeholders from the innovation ecosystem, including universities, innovation-friendly government officials, entrepreneurs and mentors, incubators, and accelerators.
- The programme has three pillars: education, mentoring and market access. It is a good example of a government intervention to guide an innovation ecosystem that uses a facilitative approach to help resolve challenges without creating market distortions.
- The programme seeks to expand the community supporting start-ups via its innovative approach to building sustainable support networks, competitiveness, and talent growth.

Source: www.inputprogram.com

La French Tech – France

The French government launched La French Tech in 2013 to create designated places that support start-ups. The goal is to boost France's international recognition and visibility. French Tech is also a brand that start-ups can be associated with.

Box 23 - La French Tech – France



- La French Tech has funding of EUR 200 million to support accelerators and EUR 15 million to internationalize French start-ups.
- It is operated by Caisse des Dépôts, which relies on Bpifrance for investment in accelerators and on Business France for international investments for international promotion.
- In 2016, France had 94 start-ups in the Deloitte Technology Fast 500 Awards, sponsored by consultancy and audit firm Deloitte to reward the fastest-growing innovative companies.

Sources:

<http://www.lafrenchtech.com/>

<http://www.caissedesdepots.fr/investissements-davenir>

Start-up visa – Denmark

Since 2015, Start-up Denmark has allowed entrepreneurs to request residence and work permits for people from outside the European Economic Area through the start-up visa programme. Denmark is the third-most welcoming country for entrepreneurs, according to a 2016 World Bank report.

Box 24 - Start-up visa – Denmark



- The permit is valid for two years and can be extended for three years at a time.
- Besides access to various programmes and subsidy schemes, visa holders receive free tailored counselling in public business development centres, where consultants provide start-up guidance on Denmark's vast opportunities for entrepreneurs, such as accelerators, co-working spaces, investment funds and grassroots initiatives.
- Entrepreneurs get most social benefits, such as health care and education. This also applies to accompanying spouses and children.
- Start-up Denmark is co-led by the Ministry of Business and Growth and the Ministry of Immigration, Integration and Housing.

Source: <http://www.startupdenmark.info/>

R&D Incentives – Netherlands

The Netherlands actively promote R&D activities through a favourable corporate tax system and specific R&D tax incentives that support innovation throughout the entire R&D lifecycle.

Box 25 - R&D incentives – Netherlands



- R&D Tax Credit: Companies performing particular R&D activities can benefit from a 32% tax credit (up to 40% for start-ups) on the first EUR 350 000 in R&D wage costs and other R&D expenses and investments, and 16% on costs and investments exceeding EUR 350 000.
- Innovation Box: Companies can benefit from an effective tax rate of only 5% on income from intangible assets – including technological innovations – created by the Dutch taxpayer and for which R&D tax credit was received.
- Top Syndicates for Knowledge Innovation (TKIs): The TKI is a partnership between public entities and private parties or investors. Cash grants of 40% are available on the private investment costs for the first EUR 20 000 and 25% for anything above that amount. In order to receive the TKI allowance, the cash grant has to be invested in the R&D project of the partnership.
- Innovation Credit, a risk-bearing loan from the government, is intended for the development phase of a technically new product, process or service, including medical products that require a clinical study. Funding varies between 25% (large companies) and 45% (SMEs) of relevant project costs, with a maximum of EUR 10 million, the remainder being financed by the company's own resources.

Source: <https://investinholland.com/incentives-and-taxes/rd-incentives/>

Innovation Fund – Serbia

Serbia's Innovation Fund promotes enterprise innovation by managing financial and technical support provided by public and donor sources to assist innovative Serbian companies and strengthen linkages between research and business sectors.

Box 26 - Innovation Fund – Serbia



- The Innovation Fund started its operations in 2011, with the Innovation Serbia Project, and works under the supervision of the Government of Serbia and the Ministry of Education, Science and Technological Development.
- The Fund received EUR 13 million under the European Union Instrument for Pre-accession Assistance.
- The Fund's vision is to support commercialization of research and contribute to the country's economic development.
- Its mission is to “promote enterprise innovation by managing financial and technical support provided by public and donor sources to assist innovative Serbian companies and strengthen linkages between research and business sectors”.
- Between 2011 and 2016, the Fund piloted two instruments:
 - a mini grant programme that supports early-stage development in micro and small companies, with up to 85% co-financing and up to EUR 85 000 per project;
 - a matching grant for up to 70% of co-financing, to help SMEs develop innovative products and services that make them more attractive for strategic partners.
- The Fund implemented a two-stage independent international project review process, and has an independent governance structure, with an international peer review system.
- Thanks to its initial success, the Fund has developed new services with clear guidelines, such as the Technology Transfer Facility and the collaborative grant scheme for R&D organizations.
- The Fund has also established an Investment Committee made up of international and diaspora professionals experienced in managing technology firms, scientific research, commercialization and the investor community.

Sources:

http://www.eib.org/attachments/general/events/innovfin_case_study_innovation_fund_20161128.pdf

<http://www.innovationfund.rs/about-if/>

Innovation Fund – The former Yugoslav Republic of Macedonia

In the former Yugoslav Republic of Macedonia, a new ICT company is established every three days. The software industry is seen as a major driver of digital transformation towards a knowledge-based economy; to support this growth, the government has launched several programmes to support the environment for SMEs, especially in terms of initial funding for start-ups.

Box 27 - Innovation Fund – The former Yugoslav Republic of Macedonia



- The Innovation Fund started its operations in 2014, with the aim to encourage and support innovation activities in micro, small and medium-sized enterprises (MSMEs).
- The financing instruments were developed in cooperation with the World Bank, and offer small grants and loans to MSMEs, start-ups and spin-offs, for the commercialization of innovations, technology transfers, and business and technology acceleration.
- As at October 2017, 37 companies had received financial support amounting to EUR 1.2 million in total.
- The Fund's objective is to provide initial support to bridge the gap where the capital market is not sufficiently developed to support innovation investments.

Source: Digital Innovation Profile, The former Yugoslav Republic of Macedonia, ITU.

Venture capital catalyst fund – Germany

The German Federal Government plans to address the lack of venture capital funding in Europe and promote start-ups through a new holding company. The aim of the new company is to improve the supply of venture capital for innovative technology-oriented companies in the start-up phase and in the particularly capital-intensive early growth phase. Germany lacks sufficient investment, especially in the phase in which companies are opening up new markets and want to expand quickly.

Box 28 - State-owned fund to stimulate venture tech capital – Germany



- As of 2018, start-ups will be able to apply to a new State-owned fund for the venture capital needed to accelerate the growth of their businesses.
- The company will be a subsidiary of the Kreditanstalt für Wiederaufbau (KfW), the State-owned German development bank, and is set to fill part of an estimated annual hole of EUR 500 to 600 million in venture capital funding.
- An oversight committee made up of representatives from the Finance Ministry, the Economy Ministry and the KfW will have to approve capital investments over EUR 12.5 million.
- In total, the new subsidiary is set to provide an annual EUR 200 million in start-up capital as of 2020, for a total of EUR 2 billion in funding over the coming decade.

Source:

https://www.kfw.de/KfW-Konzern/Newsroom/Aktuelles/Pressemitteilungen/Pressemitteilungen-Details_423745.html

3.2 Building ICT innovation capacity

One barrier to gaining the full benefit of an innovation ecosystem is that innovators need a substantial set of skills and resources, and often have to focus on addressing a broad variety of issues to foster the economic development of their solutions. Building innovation capacity, in terms of skills, infrastructure and support, is essential to accelerating digital transformation – and should be inclusive of all regions in the country. This requires good collaboration and leadership from all those involved in fostering innovation capacity, an area in which universities and private sector companies play a critical role.

Box 29 - Key enablers for innovation capacity

Key enablers for building innovation capacity feature several characteristics.

- A distinguishing feature of world-leading innovation ecosystems is that they are all driven by networks of superb research universities. Universities play a central role in nurturing entrepreneurship by laying the foundation through targeted entrepreneurial education and training, promoting entrepreneurship culture and careers, creating and supporting the concept of “born global” and facilitating access to finance.
- The private sector and established larger companies are business-driven and have to innovate in order to stay competitive. Companies and organizations should establish innovation labs, spaces where far-fetched tech ideas are pitched, tested, and either come to life or wither. Within these labs, innovation should be “systematized” and people should be given the freedom to work on projects that inspire them and that they want to own. Innovation labs should be places for exploring new technologies, building prototypes and collaborating with customers. Unfortunately, many companies build putative “innovation labs” in order to impress visitors and prospective hires, showcasing them without promoting any real experimentation and interaction.
- The private sector should play a key role in the entrepreneurial support network (incubator, accelerator) and in education (i.e. industrial experts teaching at universities, industrial placement of students, which will help companies acquire talent). Separation and lack of interaction between the knowledge infrastructure and the corporate world are the most important elements slowing down learning and competence-building processes.
- Currently, too many innovation processes remain contained within companies and fail to involve potential users, creating a “closed development world” that lacks market awareness. Firms will need to shift innovation practices towards more open models.

EuroTech Universities Alliance – Various countries

The EuroTech Universities Alliance, a strategic partnership between four leading European universities of science and technology – the Technical University of Denmark, the École polytechnique fédérale de Lausanne, Eindhoven University of Technology and the Technical University of Munich – provides a unique framework to exchange and promote entrepreneurship activities across borders, thereby offering the potential to achieve true synergies in supporting and achieving entrepreneurial outcomes. Many of the best practices of these four European universities have been identified and can be replicated.

Box 30 - Eurotech Universities Alliance – Various countries



- Finding like-minded entrepreneurs and community support that sit alongside the academic curriculum gives young people the opportunity to put their ideas to use, to practice, to iterate, and to fail with no consequences.
- If young people can engage in these activities while still in school, they will be more likely to succeed, as they will have access to resources, space, advisors, mentors, workshops and skill building before being released into a world in which they are poised for success.

Sources: https://www.kfw.de/KfW-Konzern/Newsroom/Aktuelles/Pressemitteilungen/Pressemitteilungen-Details_423745.html

<http://eurotech-universities.eu/wp-content/uploads/2015/06/EuroTechPolicyPaperfinal.pdf>

The Technical University of Munich¹⁶ Entrepreneurship Centre¹⁷ offers support and advice to technology-oriented enterprise foundations across the whole entrepreneurial life cycle, from the first idea to supporting the growth phase of the company.

¹⁶ See <http://eurotech-universities.eu/wp-content/uploads/2015/06/EuroTechPolicyPaperfinal.pdf>.

¹⁷ See <https://www.tum.de/en/tum-business/entrepreneurship/entrepreneurship-center>.

Box 31 - Technical University of Munich (TUM), Germany



- TUM's Entrepreneurship Research Institute and its centre for innovation and business creation, UnternehmerTUM, concentrate all support for business founders under one roof in a newly opened building that also hosts start-up consultants and provides ample working space for start-ups.
- The TUM Entrepreneurship Centre hosts four professorships, the TechFounders incubator and a 1,500-sq.m. high-tech workshop called Maker Space, where students, scientists and practitioners can work on their prototypes and small-series production, connecting research, education and practical aspects.
- TUM provides a range of services, fostering an entrepreneurial spirit through four main strategic elements: entrepreneurship research, entrepreneurship networking, entrepreneurship culture and an efficient spin-off process.
- The Centre for Innovation and Business Creation offers an Executive MBA degree in Innovation and Business Creation. As well as running a range of classes in entrepreneurship and innovation, TUM hosts the Centre for Digital Technology & Management, offering an interdisciplinary study programme in technology management.
- TUM is a member of various institutionalized networks of founders (Gründerregio M e.V., Social Entrepreneurship Academy, MedTech Cluster) that are well positioned in the Bavarian and German ecosystems.
- UnternehmerTUM ERASMUS, for young entrepreneurs, brings together aspiring business starters and experienced entrepreneurs from all over Europe and is financed by the European Union.
- UnternehmerTUM Funds are for early-stage high-tech start-ups. Investors in these funds include German entrepreneurs, family offices and institutional investors – including the European Investment Fund.

Source:

<http://eurotech-universities.eu/wp-content/uploads/2015/06/EuroTechPolicyPaperfinal.pdf>

The College of Management of Technology, École polytechnique fédérale de Lausanne, has an aligned focus on research and teaching in the areas of management science, with close ties to engineering and technology. It encourages cross-disciplinary partnerships and has a comprehensive approach to industrial issues and public policy.

Box 32 - École polytechnique fédérale de Lausanne (EPFL), Switzerland



- EPFL La Forge is a co-working space where new entrepreneurs can work on their projects, meet and learn from their peers and receive the support of a rich entrepreneurial ecosystem. Bi-monthly workshops are organized for entrepreneurs, investors and service providers. In collaboration with the EPFL Innovation Park, the Vice-Presidency for Innovation and Technology Transfer affords spin-offs multiple support tools such as the Prix Vittoz and other entrepreneurial prizes.
- The EPFL Venture Leaders Programme selects promising young entrepreneurs each year to discover the Boston innovation ecosystem in the United States, through a 10-day business development programme.
- EPFL INNOGRANTS have financed more than 80 teams and helped to create more than 50 start-ups since their establishment in 2005- most of the time in the form of an EPFL salary. These start-ups subsequently received more than CHF 10 million in additional grants and equity.
- The Foundation for Technological Innovation (FIT),¹ which was established in 1994, provides appropriate financial assistance at the project feasibility study stage. FIT can help complete an initial project or validate a new technology, thereby accelerating the project's commercial development. Between 2013 and 2014, FIT provided financial support to about 40 start-ups.
- ENABLE provides grants, mentoring and internships to accelerate the transfer of EPFL inventions to industry, to reduce the risk for start-up projects and to raise student awareness of innovation processes, technology transfer and entrepreneurship. In particular, it provides funding for prototyping, advanced proof-of-concept, benchmarking of inventions with existing technologies, proof of economic relevance, feasibility studies, early clinical studies and regulatory affairs. The grants provide leverage for maturing early-stage technologies, thereby easing their path to commercialization.
- Since its inception in 2010, ENABLE has supported 37 projects, more than half of which are start-up projects. Globally speaking, EPFL spin-offs have raised more than CHF 800 million from private investors since 2005 and enjoyed five trade sales since the beginning of 2014.

Source:

<http://eurotech-universities.eu/wp-content/uploads/2015/06/EuroTechPolicyPaperfinal.pdf>

¹ See <https://sti-stiftung.ch/wcms/en/home/>.

The Technical University of Denmark¹⁸ is a leading technical university at the academic and multidisciplinary forefront of the technical and natural sciences. It has many new initiatives in a number of demanding engineering disciplines, including sustainable energy technology and life science.

¹⁸ See <http://www.dtu.dk/English>.

Box 33 - Technical University of Denmark (DTU)



- The DTU SKYLAB offers a 1 550-sq.m. hub for student innovation and entrepreneurship, in order to build up students' practical competences in innovation and entrepreneurship. The hub contains a wide range of prototyping facilities, meeting rooms, project rooms and social spaces. It has three main areas: start-ups, academia and real-world projects.
- DTU INNO-KREDS focuses on improving exchange and cooperation across the university and influencing its overarching policy for innovation. Through INNO-KREDS, all departments have a person responsible for innovation and entrepreneurship. I-DTU is a systematic, module-based framework for staff activities that contribute to building up competencies and communities in innovation and entrepreneurship. It aims to give staff a common and higher understanding of innovation and how it can be used in research, teaching, project development and entrepreneurship. The DTU Student Start-up of the Year is awarded annually. Through initiatives like Bridging the Gap and Copenhagen Spin Out, DTU engages in a systematic effort to attract external entrepreneurs to spin-outs. The goal is to increase the number of viable start-ups born with a strong international focus.
- DTU-EU-XCEL is a Horizon2020-funded project in which DTU SKYLAB and five other EU university incubators offer ICT students an entrepreneurship training programme. Each partner hosts a week-long summer school, where students form cross-national teams and create projects. The best teams work further, through an online virtual accelerator and with mentor support, towards competition finals, with a money prize at the end of the year.
- The DTU Proof-of-Concept Fund is co-financed by the DTU and Danish Regional Funds and is governed by a board of seven people from various commercial and technical backgrounds. The fund operates four financing rounds per year, with a maximum grant per project of EUR 65 000. There are 12 to 15 applications per financing round and the projects span two-thirds of DTU's departments. The current ambition is to replenish the fund with investments from Danish investors and other funds, including at EU level. DTU SKYLAB collaborates with two Danish funds, giving student start-ups the opportunity to apply for small proof-of-concept grants (typically EUR 10 000-20 000). The application process runs twice a year and around five start-ups per year are expected to receive money (no strings attached) for prototyping, market research, travel expenses, etc.

Source:

<http://eurotech-universities.eu/wp-content/uploads/2015/06/EuroTechPolicyPaperfinal.pdf>

Eindhoven University of Technology¹⁹ is a research university in the Netherlands specializing in engineering science and technology. Its mission is to offer exceptional teaching and research that contribute to the advancement of technical sciences and research, the development of technological innovations, and economic growth in its own region and beyond.

¹⁹ See <https://www.tue.nl/en/university/about-the-university/profile-tue/>.

Box 34 - Eindhoven University of Technology (TU/e), Netherlands



- TU/e INNOVATION LAB plays a crucial role in nurturing future entrepreneurs through a wide range of activities and events involving students and scientists. Together with the Eindhoven Student Business Club and BrightMove, TU/e initiated STARTUP/eindhoven in 2014, which offers an inclusive set of facilities and dedicated support to students who want to explore a career either as entrepreneurs or intrapreneurs. The building provides an area with 18 flexible workplaces where start-ups can work on their business concepts and students are given free access to the “flexroom”.
- TU/e High Five Lectures are offered by experts to promote entrepreneurship. Together with Get Started, which offers lectures, workshops and network activities, they aim to inspire future entrepreneurs. BrainsAward is the annual competition challenging all enrolled students to develop and present the most inspiring, innovative, creative and socially relevant ideas or products.
- TU/e WISSENS-ALLIANZ is an INTERREG-funded project, where research and educational institutions from the Rhine-Waal Euroregion work together to support young entrepreneurs through mutual grants, training and workshops.
- BRIGHTMOVE, a joint initiative of TU/e and the Development Agencies of Brainport and Brabant, offers proof-of-concept funding and pre-seed loans for start-ups with a scalable technology. The loans are also available to student entrepreneurs.
- The EuroTech Universities Alliance Joint Educational Platform in Economics and Management of Innovation and Entrepreneurship is an initiative by 25 professors from across the four universities to build a joint shared educational platform in the field of economics and management of innovation and entrepreneurship. The aim is to promote the exchange of staff, doctoral candidates and postdocs across the four partner universities in this strategic research area.
- The EuroTech Universities Alliance European Venture Programme was launched in 2014 with funding from the ERASMUS+ programme. It offers students and scientists the opportunity to “Become an Entrepreneur in 12 days!” through exclusive access to the entrepreneurship expertise and networking resources available at the four EuroTech universities. Participating students and scientists have a unique opportunity to engage in international networking with relevant experts in the entrepreneurial ecosystems of Copenhagen, Eindhoven, Lausanne and Munich.

Source:

<http://eurotech-universities.eu/wp-content/uploads/2015/06/EuroTechPolicyPaperfinal.pdf>

Accelerators in Europe – Various countries

Accelerators provide a combination of services, including mentorship, funding, networking, training and/or office space. Most accelerator programmes run for a few months, and they often take equity in exchange for providing their services.

Box 35 - Accelerators – Europe



- Seedcamp, the first accelerator in Europe, was launched in 2007. Since then, the number of European programmes has grown steadily. In the face of stiffer competition between accelerators, programmes have become more specialized in the past few years, focusing on a particular technology, region or industry. This phenomenon is also driven to a certain extent by a rise in the number of corporate accelerators.
- Masschallenge is an industry-agnostic accelerator based in Switzerland and targeting five markets: Boston, Texas, Israel, Mexico and the United Kingdom. It takes zero equity from participants and has helped its start-ups raise over USD 2 billion after acceleration.
- OpenAxel offers a map of European accelerators and major digital companies.
- Microsoft Ventures is a corporate accelerator supporting entrepreneurs innovating in key areas such as artificial intelligence and machine learning, big data and analytics, business software as a service, cloud infrastructure, emerging trends, productivity and communications, and security.

Sources:

<https://seedcamp.com>

<http://switzerland.masschallenge.org/>

<https://www.startupbootcamp.org/>

<https://www.openfuture.org/es/spaces/wayra>

<https://next.amsterdam/>

<http://beta-i.pt/>

<https://paris.numa.co/en/>

<https://www.accelerace.io/>

<http://openaxel.com/>

<https://microsoftventures.com/>

EIT Digital – European Commission

EIT Digital is one of the communities set up by the European Institute of Innovation and Technology to promote the uptake of innovation and entrepreneurship in Europe. Its mission is “to foster digital technology innovation and entrepreneurial talent for economic growth and quality of life in Europe”.

Box 36 - EIT Digital – European Commission



- Through multi-stakeholder collaboration with entrepreneurs and over 130 top European corporations, SMEs, start-ups, universities and research institutes, the community engages in initiatives in key areas: digital industry, cities, well-being, infrastructure and finance.
- It integrates education, research and business by bringing together students, researchers, engineers, business developers and entrepreneurs.
- EIT Digital has a network of co-location centres in Berlin, Eindhoven, Helsinki, London, Paris, Stockholm, Trento, Budapest and Madrid, and a hub in Silicon Valley.
- It offers accelerator services through the EIT Digital Accelerator and promotes innovative ideas through the EIT Digital Challenge.

Source: <https://www.eitdigital.eu/about-us>

BIT Centre Tuzla – Bosnia and Herzegovina

The Business Innovation and Technology Centre in Tuzla is a business and technology incubator providing hard and soft infrastructure for start-ups and SMEs whose core business is ICT. It is regarded as a good practice in the national ecosystem.

Box 37 - BIT Centre Tuzla – Bosnia and Herzegovina



- Since 2005, the BIT Centre has hosted over 53 companies and employed more than 500 highly skilled individuals.
- It has enabled more than 6 000 people to improve their technical and entrepreneurial skills through workshops and training programmes.
- In partnership with the Faculty of Electrical Engineering in Tuzla, the BIT Centre established the ICT Research Lab and implemented the HERD project, focused on university-industry collaboration and tech transfers.
- This collaboration is continuing as the ERASMUS+ project BENEFIT, in which the BIT Centre fosters soft infrastructure in the local innovation ecosystem and acts as a bridge between academia and industry.

Source: Digital Innovation Profile, Bosnia and Herzegovina, ITU.

R&D labs – The former Yugoslav Republic of Macedonia

In this country, innovation and R&D, both at public research institutions and in the private sector, are constrained by a significant lack of funding. The gross expenditure dedicated to R&D (GERD) represented only 0.4% of GDP in 2015. Traditional universities tend to focus on teaching, leaving R&D opportunities unexploited. To improve research facilities and to stimulate project commercialization, the Ministry of Education and Science established a network of sophisticated laboratories at six public universities across the country.

Box 38 - R&D labs – The former Yugoslav Republic of Macedonia



- Computer science, engineering, medical and other faculties and institutes across six public universities were equipped with 79 R&D laboratories.
- The project, worth EUR 26 million and started in 2010, aims to provide quality practical training for students and R&D opportunities for the scientific community and the business sector, and to strengthen industry/academia partnerships.
- It integrates education, research and business by bringing together students, researchers, engineers, business developers and entrepreneurs.

Source: Digital Innovation Profile, The former Yugoslav Republic of Macedonia, ITU.

AEI – Poland

The Academic Enterprise Incubator (AEI) was established by Wrocław University of Technology in 2006. Its aim is to nurture the development of entrepreneurs in the academic community and to support business activities through the commercialization of products.

Box 39 - AEI – Poland



- AIE targets innovators in the academic community who want to establish microbusinesses.
- It offers services such as legal and accounting advice, funding consultancy, subsidized infrastructure (offices and conference rooms) and technology transfer services, including intellectual property protection and spin-off.
- Incubation support is provided for the first three years.
- AIE promotes the position of the university as a centre of excellence in innovation and technology.
- The AEI Director is elected by the Senate; the governance model also comprises a supervisory and a consulting board.
- The project is financed by the Ministry of the Economy.

Source:

<http://www.inkubator.pwr.wroc.pl/pages/aip?locale=en>

<http://startuppoland.org/en/incubator/academic-entrepreneurship-incubator-of-wroclaw-university-of-science-and-technology/>

Catapult centres – United Kingdom

Catapults are not-for-profit, independent, physical centres connecting businesses with the United Kingdom's research and academic communities.

Box 40 - Catapult centres – United Kingdom



- Each catapult centre specializes in a different area of technology, but all offer a space with the facilities and expertise to enable businesses and researchers to collaboratively solve key problems and develop new products and services on a commercial scale.
- After less than five years of operations, the Catapult programme has already delivered extensively on the commitment “to transform the UK’s capability for innovation in specific areas and help drive future economic growth”: it has delivered 636 academic collaborations, supported 2 851 SMEs, delivered 2 473 industry collaborations, worked across 24 countries around the world, and operated GBP 850 million of open-access research and demonstration facilities for the benefit of UK industry and academia.

Source: <https://catapult.org.uk/>

3.3 Integration of ICT innovation ecosystems into key sectors

Good practices in integrating ICT innovation into key sectors include nurturing innovation networks, supporting demand-side innovation, promoting appropriate solution development by leveraging key technologies for a sector, and fostering cluster formations of relevant industries in the national or regional context.

Estonian State Portal – Estonia

Estonia has developed a leading suite of e-governance services, including single-window services for a number of areas of government and a centralized service for identification and public records, thereby reducing duplication of services and the bureaucratic burden on citizens. These services have created a strong innovation ecosystem supporting the public sector, and are leading to increased positive externalities in other sectors of the Estonian economy.

Box 41 - Estonian State Portal Estonia



- The portal offers a secure online environment through which Estonian residents can easily access the State's e-services and information on the law, money and property matters, education, administrative procedures, etc.
- The portal is used by individuals, entrepreneurs and public sector agencies offering services.
- One flagship service is the Estonian e-Residency programme, a transnational digital identity available to anyone in the world interested in establishing an e-business from Estonia.

Source: <https://www.eesti.ee/en/>

e-Albania initiative – Albania

In Albania, promoting ICT services helped achieve a core development goal, by stimulating demand in e-government and services. The services created much-needed demand from the public sector, placed innovation on the national agenda, and established the foundation for digital transformation in the ecosystem.

Box 42 - e-Albania initiative – Albania



- The e-Albania initiative, the transparency initiatives, the Innovation Hub, and other efforts provide opportunities for ecosystem growth and public service transformation.
- e-Albania activities have also been of clear benefit to innovation in Albania. In particular, they have served to prime both innovators and the market.
- They have pushed innovators into areas creating value for the market through public service and have supported successful innovations through procurement.
- They have also helped to acclimatize the public to technology and innovation, preparing the market for a range of potential digital services.
- The same observations apply to municipal smart city and innovation initiatives, which have had similar impacts. While there are positive and negative aspects to all of this, the e-Albania initiative appears to have had a net positive effect on the culture of innovation in the country.

Source: ICT Centric Innovation Country Review – Albania, ITU

AgroIT – Hungary

AgroIT is a bridging cluster similar to those recommended above. In addition to traditional cluster benefits of increased synergies and networks, it connects ICT firms with agribusinesses in order to develop innovative ICT solutions in the field of agriculture.

Box 43 - AgroIT – Hungary



- To achieve AgroIT's objectives, the stakeholders seek to exploit synergies through more efficient use of resources, communication, advocacy and access to foreign markets.
- The cluster goal is to increase competitiveness, ensure market presence and support R&D through various mechanisms, such as providing IT services that are appropriate for farmers, expanding the knowledge base and promoting research.
- It promotes the development of appropriate technology solutions for leveraging and combining robotic or process management systems, software and drones.

Source: <http://agroit.hu/en>

Corallia – Greece

Corallia is a Greek initiative to foster cluster development in ICT. At the moment it incorporates clusters in gaming, microelectronics and space technologies.

Box 44 - Corallia – Greece



- By bringing together key players in campuses around the country, Corallia allows ICT resources to be shared and integrated more efficiently, and the campuses provide resources, networking and community to the firms housed in them.
- Corallia's vision is to develop "a Greek environment with the right framework conditions to allow sciences, innovation and entrepreneurship to flourish (again)".
- Corallia is one of the first organizations established in Greece for the structured and systematic management and development of innovation clusters. It uses productive innovative ecosystems, coordination and support to nurture specific sectors and regions of the country.
- The clusters build on competitive advantages and export orientation where they exist.
- Cluster members have access to a portfolio of services addressing R&D, cluster expansion, education and training, commercialization, innovation and technology, and policy action.
- Three clusters have been developed so far: the Space Technologies and Applications Cluster, the Gaming and Creative Technologies Applications Cluster, and the Nano/ Microelectronic-based Systems and Applications Cluster.

Sources:

<http://www.corallia.org/en>

<http://www.corallia.org/en/news/press-releases/2385-greek-government-and-itu-meets-the-greek-innovation-ecosystem.html>

Niš Cluster of Advanced Technologies – Serbia

The Niš cluster initiative comprises 24 local companies, two scientific research institutions (Faculty of Electronic Engineering and Faculty of Mechanical Engineering, University of Niš), and three economic development support institutions (Regional Development Agency South, Regional Chamber of Commerce and Business Incubator Niš).

Box 45 - Niš Cluster of Advanced Technologies – Serbia



- Through the ICT Cluster Academy, companies work with academia to develop appropriate curricula that meet their needs, thereby improving talent readiness.
- Access to funds, including international or domestic funds such as the innovation fund, is facilitated through a consortium approach.
- The focus is on key project development in smart cities, health, ageing, environmental protection, robotics and optoelectronics.
- The aim is to foster joint ventures and a synergistic approach to services that benefits the cluster as a platform.

Source: Digital Innovation Profile, Serbia, ITU: <http://ni-cat.org/index.php/en>

Business angel networks and syndicates – across Europe

Business angels are increasingly important in providing risk capital and play an important role in helping entrepreneurs validate their business ideas. In many countries, they constitute the second largest source of external funding for newly established ventures, after family and friends. Business angels are contributing to economic growth and technological advances. Angel investors provide business management experience, skills, and contacts for the entrepreneur.

Box 46 - Business angel networks – Europe



- The creation of business angel networks, organizations aimed at matching entrepreneurs looking for venture capital with business angels, is of great importance in Europe, where angel investment lags behind the United States.
- Alternatively, several business angels are collected in an informal consortium, or syndicate, for the purpose of creating a critical mass of funds in excess of what each business angel could or would be prepared to invest.

Sources:

European Business Angels Network (EBAN): www.eban.org

Business Angels Netzwerk Deutschland: www.business-angels.de

digitalswitzerland – Switzerland

Creating a cross-industry association is beneficial for all the stakeholders in the ecosystem. digitalswitzerland is a cross-industry association created from the shared vision of its members to strengthen the country's position as a digital hub and to project those benefits across the whole of Switzerland in sectors such as financial and medical technology, the life sciences and fashion. As a sign of personal commitment and dedication, the members launched several initiatives, focusing on three key areas: attracting outstanding digital talent, helping existing companies master digital challenges and significantly strengthening the Swiss start-up ecosystem.

Box 47 - digitalswitzerland – Switzerland



Political framework

- Digital innovators, start-ups and entrepreneurs but also a large number of successful SMEs play a role as key drivers of innovation and future growth.
- digitalswitzerland seeks to combine – and to amplify – the voices of many of these important participants in the digital transformation in order to promote and help shape political conditions and regulatory frameworks that are conducive to the development of new technologies, new business models and the influx of capital and talent.

Education and talent

- digitalswitzerland offers a digital platform that bundles education offerings in the fields of digital innovation and transformation, and provides employees and learners with access to these areas.
- With the www.educationdigital.ch initiative, digitalswitzerland supports digital education offerings for children and adolescents. It connects existing platforms and provides reach and publicity.

Start-up enablement

- digitalswitzerland initiatives provide start-ups with vital business knowledge and coaching. They offer rich networking opportunities and provide access to funding.
- At the same time, corporate members and sponsors benefit from high-speed access to leading start-ups and top talent that can help them accelerate their own ideas and their digital transformation processes.
- Kickstart Accelerator is a core digitalswitzerland programme that provides corporate entities with high-speed access to the Swiss innovation ecosystem.
- Venture Kick and its programmes and events aim to close the gaps within the Swiss innovation chain. Venture Kick focuses on supporting the development of both Swiss and international founders, from the first idea to successful scaling for international markets.
- digitalswitzerland creates events, such as the World Web Forum and the Investor Summit, that seek to provide platforms where established organizations, pioneering new talent and influential stakeholders in the digital transformation can build important connections and find further inspiration.

Source: <http://www.digitalswitzerland.com/>

Glossary

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

Angel investment: Early investment intended to provide a one-time boost to launch and develop a start-up, often provided by entrepreneurs, friends or families and connected with mentorship

B2B: Business-to-business services or products, i.e. those provided by private sector companies for use by other private sector companies

BDT: The ITU Telecommunication Development Bureau

Big data: An emerging ICT field focused on the analysis and application of the large-scale data sets being developed by online services, public information and the Internet of Things

Co-working spaces: Offices split into various work stations and spaces for rent by clients (often incorporating skills training, community building or other soft infrastructure functions)

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 and labs that provide entrepreneurs with resources such as training, mentorship and business services

Equity/equity finance: Investments or other services provided in exchange for partial ownership or a share of company profits going forward

Equity crowdfunding: A crowdfunding campaign in which contributors obtain a share of the profits or a stake in the company rather than traditional perks

EU: European Union

Exit: The point at which the founders sell their investment in the company, often through an IPO, to limit losses (from a failing company) or make a profit (from a successful one)

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

Hard infrastructure: The physical infrastructure needed to conduct business, such as mobile and fixed connectivity, power, water, roads, physical plants and equipment

ICT: Information and communication technology, an umbrella term covering wireless and wired communications, the hardware and software related to them and their applications

ICT-centric innovation ecosystem: An innovation ecosystem that recognizes that ICTs are often at the centre of innovation and have a cross-cutting role in many other sectors of the economy

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

Innovation: The implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new 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

Innovation systems: An understanding of innovation as a process representing the flow of information and collaboration between various players

Investment rounds: A series of investments intended to develop a business, each round focusing on a different stage of development (developing business models, expanding and scaling)

Intellectual property/intellectual property rights: The rights of persons over their creations, which usually give the creator an exclusive right over the use of the creation for a certain period of time

Internet of Things (IoT): An emerging ICT field focused on communication between connected devices and the potential technical applications that can emerge from it

IPO: An initial public offering, or the first time that the stock of a private company is offered to the public. This often raises significant amounts of capital, but turns the company into a publicly traded firm.

ITU: International Telecommunication Union, the lead United Nations specialized agency for ICT

OECD: Organisation for Economic Co-operation and Development

Open innovation: A variation on traditional research

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

R&D: Research and development

Risk finance/risk capital: High-risk, high-reward investments, often made in early-stage start-ups or SMEs and covering a range of specific services, angel funding, seed funding, venture capital and others

SDGs: The Sustainable Development Goals adopted under the 2030 Agenda for Sustainable Development

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

SME: A private, small or medium-sized firm that is no longer a start-up, but is still young, with limited staffing and/or income. The exact definition in terms of upper and lower age and scale limits varies between institutions.

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

Tech park: A strategically planned space designed to provide office space, connection to universities and other resources for firms in the ICT sector, often accompanied by tax breaks or other benefits from the public sector

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

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 supports and often fail during this time

WSIS: World Summit on the Information Society

WTDC-17: The 2017 World Telecommunication Development Conference, held in Buenos Aires, Argentina

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