Digital Skills Toolkit

DECENT JOBS FOR YOUTH

DIGITAL SKILLS CAMPAIGN

ITU

Digital Skills Toolkit

Acknowledgements

Please consider the environment before printing this report.

Skilling up for our digital future

We are living in the midst of a digital revolution. More people are connected to the Internet than ever before, using digital devices and services for work and for all aspects of their life. In part this has been fuelled by the rise of mobile broadband, which every day ensures the participation of more people in developing countries in the digital economy. New technologies have also proliferated over the past decade – some even more recently – artificial intelligence, big data, blockchain, cloud computing, Internet of Things, machine learning, mobile applications, nanotechnology and 3D printing among others. These will drive profound change in our daily lives over the coming decade, radically altering how we consume, produce and work. And, as with all transformational changes, they present us with great opportunity – and significant challenge too.

The challenge is clear. A large skills gap has emerged – with tens of millions of jobs opening up around the world for those with advanced digital skills – and a shortage of qualified people to fill the positions. Chinese government data highlights the need for 7.5 million ICT specialists while in Europe, estimates point to 500,000 positions for ICT professionals going unfilled by 2020.

The opportunity that accompanies the challenge is immense. Imagine a country where basic digital skills are prized, promoted and prioritized for all its people – integrated as one of the nation's foundational skills alongside traditional literacy and numeracy skills. Imagine a country where *all segments of the population* can access news and information, communicate with friends and family, make everyday use of services related to e-health, e-government, digital finance, agro-tech, smart transportation – and benefit fully from immersion in a vibrant and global knowledge society. Imagine a people that has the requisite digital skills to be employable, productive, creative, and successful – societies where all our young people can develop basic skills and then progress to acquire intermediate and advanced levels of digital expertise – able to participate in emerging industry sectors and to start their own businesses.

But how do we bridge the gap between challenge and opportunity? This Digital Skills Toolkit enables policymakers and influencers to work strategically in building that bridge. It addresses the many complexities of devising and advancing digital skills at policy level. It maps out how digital skills take their place within a wider framework of soft, twenty-first century skills. It offers clear guidance on bringing together – and leading – different stakeholders and moving forward under one clear and focused framework. The toolkit's outstanding strength is its hands-on, how-to practicality and its grounding in experience from around the world. In addition to offering tools that convert complexity to manageable tasks, the toolkit brims with real-life examples of ambitious projects and programmes that impress and inspire. In Bangladesh, women in rural areas are learning mobile app and web design and providing freelance services at home and abroad. Africa Code Week is a five-year campaign engaging one million young people, and equipping 200,000 science teachers with resources to teach ICT – in 2016, the campaign engaged over 400,000 students across 30 countries, including a nearly 50% participation rate of girls in the coding workshops. The Vietnam Farmer's Union (VNFU) is training 30,000 farmers on use of the internet, basic productivity tools, and agricultural apps. Argentina is training 100,000 programmers, 10,000 professionals, and 1,000 entrepreneurs over four years. There are many more examples.

The toolkit also forms part of ITU's support to Decent Jobs for Youth, the global initiative to scale up action and impact on youth employment in support of the 2030 Agenda for Sustainable Development.

Launched by the International Labour Organization (ILO) in 2016 with the endorsement of the executive heads of the United Nations (UN), Decent Jobs for Youth has united the efforts of more than 20 UN entities along with a range of partners, including governments, social partners, youth and civil society, the private sector, regional institutions, parliamentarians, foundations, academia and the media.

Decent Jobs for Youth is currently focusing on eight thematic priorities for action. One of these is digital skills for youth, led by ITU. As part of this effort, ITU has made a number of commitments to the global initiative, on its online engagement platform, including jointly leading with the ILO the Digital Skills for Decent Jobs for Youth Campaign to incentivize stakeholders to equip young people with job-ready, transferrable digital skills and foster the creation of employment opportunities for youth in the digital economy.

This Digital Skills Toolkit complements ITU's contribution to Decent Jobs for Youth as a distinct knowledge product that provides new, updated guidance on how to ensure young people are equipped with and further develop job-ready digital skills. It will also support the design of national digital skills development strategies for life and work of all citizens in the growing digital economy.

I am confident that ITU members, the Decent Jobs for Youth community and influencers everywhere will be inspired by this toolkit – that it will take us a significant step further in fulfilling the potential and the promise of our digital future.

Brahima Sanou
Director, Telecommunications Development Sector, ITU

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Introduction

Introduction to this toolkit

This toolkit provides stakeholders with guidance on developing a digital skills strategy. It is intended for policymakers, along with partners in the private sector, non-governmental organizations, and academia. Its overarching aim is to facilitate the development of a comprehensive digital skills strategy at country level. It is also possible to use this guide to focus on selected priorities that require a fresh approach.

Why do countries need a digital skills strategy?

Digital skills underpin nearly every aspect of work and life. From filling in a government form to communicating for work, it is difficult to find a job or life-task that does not require a basic level of digital functioning. And with new technologies emerging every day, we need lifelong opportunities to learn new skills that will allow us to succeed in an era of ongoing digital transformation.

Digital skills are essential in opening the door to a wide range of opportunities in the 21st century. Countries that implement comprehensive digital skills strategies ensure their populations have the skills they need to be more employable, productive, creative, and successful while ensuring they remain safe, secure and healthy online. Critically, digital skills strategies need to be updated regularly to respond to the emergence of new technologies and their impact on the digital economy and digital society.

The digital economy has created a huge shortage of people with the necessary digital skills. ITU research shows that there will be tens of millions of jobs for people with advanced digital skills in the coming years[1]. In Europe, for example, estimates suggest there will be 500,000 unfilled positions for ICT professionals by 2020.[2] Every region faces similar challenges. In addition to existing skills gaps, experts forecast that advances in areas like artificial intelligence, nanotechnology, 3D printing, and other technologies will usher in a new era that will radically alter patterns of consumption, production, and employment.[3] Many countries view digital skills as one of the core foundations of the digital transformation.

How to use this guide

This toolkit provides policymakers and other stakeholders with practical information, examples, and step-by-step guides to help develop a national digital skills strategy. It can also be used to develop policies and programmes to address specific priorities.

There are 12 chapters:

- Chapter 1 provides a checklist for developing a national digital skills training programme – which ensuing chapters flesh out in detail.

- Chapter 2 provides an overview of digital skills.

- Chapter 3 covers a range of stakeholder engagement models that can be used to develop a digital skills strategy, recognizing digital skills are necessary across sectors.

- Chapter 4 provides guidance on making an inventory of existing policies and programmes.

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[1]   ITU and ILO, Digital Skills Thematic Priority of the Global Initiative on Decent Jobs for Youth, https://www.decentjobsforyouth. org/wordpress/wp-content/uploads/2017/11/Thematic-Plan-1-Digital-Skills.pdf
[2]   https://ec.europa.eu/digital-single-market/en/policies/digital-skills,
[3]   http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf

The next six chapters guide the reader through specific strategies designed to develop digital skills:

- Chapter 5 covers basic and intermediate skills.

- Chapter 6 covers advanced skills.

- Chapter 7 addresses strategies for under-represented groups.

- Chapter 8 examines campaigns as an effective awareness raising strategy.

- Chapter 9 highlights the opportunities of using existing online training resources.

- Chapter 10 offers various options for assessing the progress of digital skills programmes.

- Chapter 11 offers sample digital skills roadmaps.

- Chapter 12 looks at future developments and emerging trends.

Readers will locate tools that policymakers and stakeholders can use in developing ideas specifically for their country or context in Chapters 3 to 8. An editable Word version of these tools is attached to the PDF version of this Toolkit. Please click on the paperclip attachment icon in the left navigation bar to open this editable Word file.

Countries can use the toolkit in its entirety and develop a comprehensive digital skills strategy or they may focus on a specific area and develop policies and programmes that will advance digital skills for this purpose – for example how to target under-represented groups.

The tools in this guide were created to stimulate discussion, and were not intended to account for every possible context or pathway towards a digital skills strategy. In practice, digital skills strategies will take different formats – top-down, bottom-up; multi-sectoral entry channels; single entry channel, and so on: readers are advised then that the toolkit has not been designed as a rigid roadmap.

Other resources

Each chapter contains real-life examples highlighting successful approaches that countries have taken related to the chapter's topic. Several recent publications and online resources have documented successful approaches to promoting digital skills development and readers are encouraged to explore these. Starting points include:

- Working Group on Education: Digital Skills for Life and Work, Broadband Commission for Sustainable Development, ITU and UNESCO. This report provides a complete picture of digital skills, offers a number of policy recommendations, and presents nine case studies. Each of these is several pages long, illustrating in some depth how countries have implemented digital skills strategies.

- Digital Skills & Jobs Coalition initiatives repository. The European Commission has compiled a repository of Europe's best digital skills projects. The repository is searchable by target group and keyword, making this a valuable resource to find projects that meet specific needs.

- The Digital Inclusion Newslog is a service provided by the ITU Telecommunication Development Sector. It regularly posts news stories that offer valuable examples across a wide range of digital inclusion topics.

Chapter 1: Policymaker's platform – the road ahead

The following pages pull together the strategic elements you need as a policymaker – or other stakeholder – to build vibrant digital skill development well into the future in your country, at national, regional or local level. As the seismic shift towards a global, digital economy continues to gather momentum, digital skills are increasingly moving centre-stage in all economies – both developed and developing. This digital skills toolkit, rich in real-life example and packed with practical advice, will offer invaluable help in making the most of the immense opportunity offered by the digital economies and digital societies that will define our future.

All elements set out below are explained in detail and illustrated in this digital skills toolkit. Feel free to make use of all or any of them as appropriate to your country context.

Your roadmap to accelerated digital skills development

1. Create a digital skills coalition, council or task-force:

    a. Use the coalition/council/task-force to engage a range of stakeholders who can contribute to developing and/or implementing the strategy, including identifying current and future digital skills needs and goals, ideally across sectors.

    b. Analyse the strengths and weaknesses of each stakeholder, and from this, identify the role they can play in defining and implementing the strategy.

    c. Agree on governance, working methods or charters for the council/coalition/task-force.

2. Define the main categories of digital skills that the strategy will develop, recognizing that digital skills exist on a spectrum from basic, intermediate to advanced skill levels.

    a. Alternatively define the digital competence areas the strategy will foster; or

    b. Consider defining digital skills' relation to 21st century skills.

    c. For education, consider providing foundations for more advanced digital skills such as computational thinking.

3. Inventory existing policies, plans and programmes that support the development of digital skills and analyse how they can be used to support the goals of the digital skills strategy.

4. Identify current and future trends in relation to demographic trends, technological changes, business trends, trade, industrial policies, and the shift to a greener economy, etc.

5. Identify new policies and programmes that are needed and conduct advocacy both using the existing policies and to build support for new policies.

6. Draft a digital skills development strategy:

    a. Identify the digital skills development goals for:

    • primary education;

    • secondary education;

    • tertiary education: for students, and digital technology development & design experts;

    • work-related digital skills training programmes for out-of-school youth, including for freelancers and part-time workers;

    • work-related digital skills training programmes for adults requiring re-skilling;

    • skills for life in the digital economy for all citizens;

Digital Skills Development Strategy Part 1: Getting Ready

DIGITAL SKILLS DEVELOPMENT STRATEGY PART 1: GETTING READY

The following elements can be used as a checklist or guidance for policy makers and other stakeholders developing a regional, national or local digital skills development strategy or road map. Certain elements may have more or less relevance to specific contexts, and the checklist should be updated over time to take into consideration technological, social and economic developments.

Part 1 of the digital skills development strategy, "getting ready" is to be read together with Part 2 of the digital skills development strategy, "implementation."

GETTING READY

Engage with stakeholders
Create a digital skills coalition, council or task force

Set digital skills development goals
Define the main categories of digital skills the strategy will develop, recognizing that digital skills exist on a spectrum from basic, intermediate to advanced skill levels

Identify supporting policies
Inventory existing policies, plans and programs that support digital skills development and analyse how they can be used to support the goals of the digital skills strategy

Prepare a draft
Set digital skills development goals and strategies for:

- EDUCATION
  Primary
  Secondary
  Tertiary
- ADULT RESKILLING
- UNDERREPRESENTED POPULATIONS, E.G. Women Refugees
- OUT OF SCHOOL YOUTH
- LIFE IN THE DIGITAL ECONOMY

for each element identify:

- Targets,
- Priorities,
- Budget, incentives and scholarships,
- New and existing channels and programmes for delivery,
- Training providers' needs, promising solutions for delivery

Seek public comments
Seek comments on the draft strategy by the council or coalition and then publish the strategy for public comment before finalizing it

Improve and publish

LAUNCH

Source: ITU

Digital Skills Development Strategy Part 2: Implementation

DIGITAL SKILLS DEVELOPMENT STRATEGY PART 2 : IMPLEMENTATION

The following elements can be used as a checklist or guidance for policy makers and other stakeholders developing a regional, national or local digital skills development strategy or road map. Certain elements may have more or less relevance to specific contexts, and the checklist should be updated over time to take into consideration technological, social and economic developments.

Part 2 of the digital skills development strategy, "implementation" is to be read together with Part 1 of the digital skills development strategy, "getting ready".

IMPLEMENTATION

Conduct Outreach and Promotions

Foster communities of practice

Reinforce through campaigns

Collect data and monitor

Periodically review and update
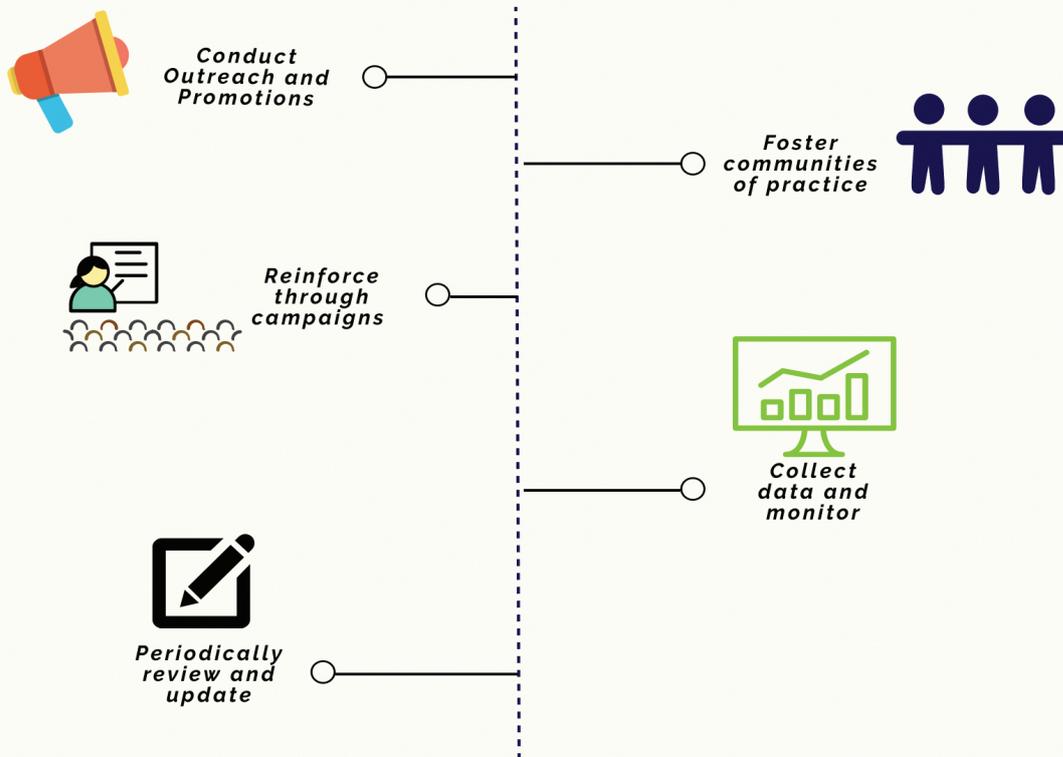
Source: ITU

- training programmes both for life and work for under-represented populations;
- develop or plan for a digital entrepreneurship skills strategy.

b. Benchmark the goals against existing frameworks or countries with similar goals.

c. Identify the existing priorities and challenges in meeting the above goals.

d. Identify promising solutions for providing digital skills that address the common challenges identified in this toolkit.

e. Develop a budget for implementation and identify funding sources, incentives and subsidies for training fees, in particular for under-represented populations.

f. Identify existing channels for delivery of different types of digital skills training, including employer-led training, technical and vocational training, coding bootcamps, other commercial or civil society training providers, makerspaces, informal providers who support digital skills campaigns, running campaigns etc.

g. Identify need for new channels and strategy for developing these channels.

h. Identify the needs for providers (funding, training, curriculum development) and agree on strategies to address these needs, including creating communities of practice among training providers.

i. Identify available training programmes, curriculum and providers that can be leveraged to meet the strategy's goals and develop new curricula where necessary.

j. Identify gaps in training programmes and curricula – and identify providers and strategies that will help fill them.

k. Set objectives and targets for each component of the strategy *(e.g. introduce computational thinking in secondary school curriculum by [date]; revise university computer science curriculum to match employers needs by [date]; train all citizens to complete online government forms; etc).*

7. Seek comments on the draft strategy from the council or coalition and then publish the strategy for public comment before finalizing it.

8. Launch the strategy.

9. Conduct outreach, communications and promote the strategy and its training opportunities.

10. Hold periodic regional, national or local forums to foster communities of practice among existing training providers to improve skills provision and grant awards to incentivize implementation of the goals of the digital skills strategy.

a. Publish good practices and resources identified in the forums to share with digital skills stakeholders.

11. Launch a regional, national or local digital skills campaign or join existing campaigns, including global campaigns, to incentivize stakeholders to provide digital skills training in line with the different components of the agreed digital skills strategy.

12. Collect data to support benchmarking and monitoring.

13. Monitor, through reporting outcomes and outputs, together with their respective KPIs.

14. Review and update the strategy periodically, ensuring it reflects future job predictions and technological developments.

Chapter 2: Understanding digital skills

Overview

As we begin, it is important to have a common understanding of what is meant by digital skills.

The worldwide expansion of the digital economy and digital society requires us to be equipped with an array of digital skills that will allow us to succeed in work and life.

In the world of work, digital skills not only qualify us for jobs in conventional sectors, but also open doors to participate in emerging sectors and even to start our own businesses. People with more advanced digital skills can take advantage of an even wider range of opportunities brought about by ongoing advances in digital technologies, platforms, and devices. Digital skills are particularly important when considering the changing nature of the work environment, including the sharp growth in the use of freelancers and people participating in the gig economy, as well as broader structural changes that will profoundly impact the jobs of the future.[1]

People with relevant digital skills can safely access news and information, communicate with friends and family, and access important services related to e-health, e-government, digital finance, agro-tech, smart transportation, and otherwise enjoy the many benefits of participating in the global knowledge society.

The kinds of digital skills required to succeed are dramatically different today from those required even just five years ago. We used to be able to identify a discrete set of digital skills and have confidence that training programmes would equip citizens with those skills. These typically covered topics like basic hardware and software operations, email, and search. Today, we need continually to review and update those digital skills being taught as a result of new technologies and innovations – artificial intelligence, big data, blockchain, cloud computing, Internet of Things (IoT), machine learning, and mobile applications. This fast-changing backdrop makes it important for countries with existing digital skills training programmes to update their strategies and for those countries who have yet to launch a national digital skills programme to take action.

Digital skills levels: basic, intermediate, and advanced

This chapter summarizes the types of digital skills by level: basic, intermediate, and advanced. Many strategies reference these levels. In practice, digital skills exist on a continuum, so the following descriptions are intended to provide general definitions that can help orient national policy discussions.

> Digital skills exist on a spectrum, from basic to more advanced, and encompass a "combination of behaviours, expertise, know-how, work habits, character traits, dispositions and critical understandings."[1]
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> ———————
>
> [1] Broadband Commission for Sustainable Development (2017). Working Group on Education: Digital skills for life and work. p4.

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[1] World Economic Forum, The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution, January 2016. http://reports.weforum.org/future-of-jobs-2016/

Basic skills

Basic digital skills enable us to function at a minimum level in society. They are foundational skills for performing basic tasks, and there is growing consensus that basic digital functioning corresponds to a foundational literacy, taking its place alongside traditional literacy and numeracy (see 21st century skills figure below). Basic skills cover hardware (for example using a keyboard and operating touch-screen technology), software (for example word processing, managing files on laptops, managing privacy settings on mobile phones), and basic online operations (for example email, search, or completing an online form). Basic skills enrich our lives, enabling us to interact with others and access government, commercial and financial services.

Intermediate skills

Intermediate skills enable us to use digital technologies in even more meaningful and beneficial ways, including the ability to critically evaluate technology or create content.[2] These are effectively job-ready skills since they encompass those skills needed to perform work-related functions such as desktop publishing, digital graphic design and digital marketing. For the most part, these skills are generic, meaning their mastery prepares individuals for a wide range of digital tasks needed to participate as engaged citizens and productive workers. However, such skills are not set in stone. Indeed, one of the characteristics of intermediate skills in particular is that they expand to account for changes in technology. For instance, data skills feature more prominently as the data revolution gains further momentum, generating demand for skills needed to produce, analyse, interpret, and visualize large amounts of data.

Advanced skills

Advanced skills are those needed by specialists in ICT professions such as computer programming and network management. Globally, there will be tens of millions of jobs requiring advanced digital skills in the coming years. These include artificial intelligence (AI), big data, coding, cybersecurity, Internet of Things (IoT), and mobile app development, with some economies predicting a talent gap for workers with advanced digital skills and others, ranking ICT specialists among their fastest-growing roles.[3] Many employers claim they cannot find staff with the requisite skills. Jobs requiring advanced digital skills also generally pay much more than jobs requiring basic digital skills or none at all. Advanced skills are typically acquired through advanced formal education, though this toolkit describes other channels for learning, such as coding bootcamps, that are viable options for many countries.

Another skill-set in the advanced category is that of digital entrepreneurship, which combines traditional entrepreneurship with new digital technologies. "Digital enterprises are characterised by a high intensity of utilization of novel digital technologies (particularly social media, big data analytics, mobile and cloud solutions) to improve business operations, invent new business models, sharpen business intelligence, and engage with customers and stakeholders."[4]

Strategies aimed at fostering digital entrepreneurs need to address a range of skill-sets. They include non-digital elements such as business, finance and tax, often linking to related digital innovations. Such skill-sets include entrepreneurial skills – for example risk-taking, adaptability and critical thinking – and intermediate and advanced digital skills such as data analytics, cloud, social media, digital marketing, and web and app development. The move to digital entrepreneurship has already given rise to a

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[2]   Broadband Commission, page 27

[3]   "Decent Jobs for Youth" Digital Skills thematic plan at https://www.decentjobsforyouth.org/wordpress/wp-content/uploads/2017/11/Thematic-Plan-1-Digital-Skills.pdf

[4]   European Commission, Strategic Policy Forum on Digital Entrepreneurship, *Fuelling Digital Entrepreneurship in Europe – Background Paper*.

growing number of special master's degree programmes and related digital technology-for-business courses.[5]

The concept of digital entrepreneurship, however, is evolving, and is the topic of ongoing analysis, such as the Broadband Commission Working Group on Digital Entrepreneurship, which is expected to publish its findings in 2018 and 2019[6]. Thus, rather than include skills strategy recommendations around digital entrepreneurship, this toolkit suggests readers should continue to monitor ongoing changes in order to guide the development of their future strategies in this area.

We should also recognize that learning intermediate and more advanced digital skills has opened up opportunities for digital businesses and freelancers. In Bangladesh, for example, women in rural areas are learning skills such as mobile app and web design and are providing freelance services both domestically and abroad,[7] while in Pakistan the Ministry of Information Technology and Telecom, in partnership with the Virtual University of Pakistan and Telenor and through the IGNITE National Technology Fund, plans to train one million people in digital skills for 'e-lancing'[8].

Moreover, women and young people who learn web design or digital marketing can continue to develop more advanced digital skills, paying for their training by working as freelancers. And *all* business people can tap into the large array of online courses, many of them free, to learn more about relevant legal, regulatory, entrepreneurship and digital skills to increase their business opportunities. These developments can already be reflected in national digital strategies.

Continuum of digital skills
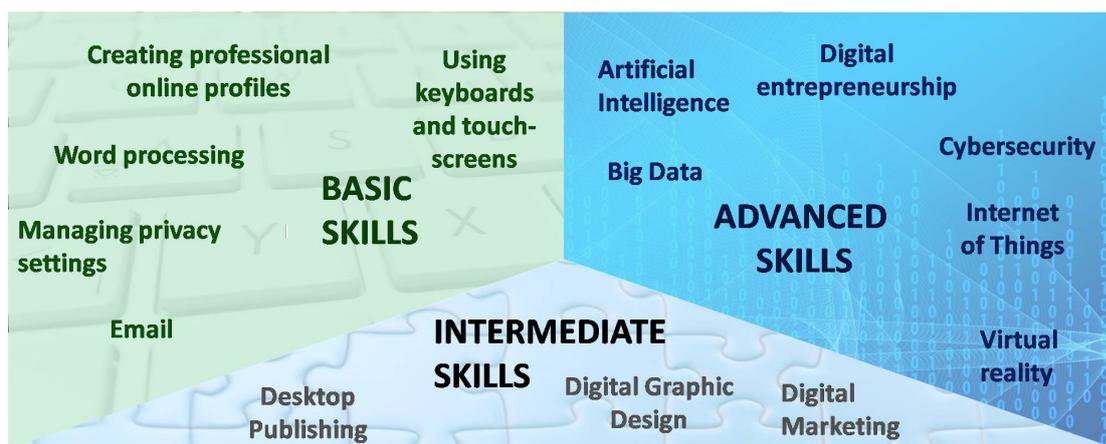
Source: ITU

Digital skills frameworks

As mentioned, digital skills develop across a continuum, and they are constantly being updated in line with changes in technology. Digital skills frameworks serve a critical role in capturing the range of skills as well as these changes, thereby allowing policymakers and digital skills providers to ensure that their programmes and training curricula remain relevant and current. Many organizations and international agencies have developed digital skills frameworks. Below we highlight the work of the European Commission—the Digital Competence Framework for Citizens (or DigComp).

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[5]   See for example, HEC Paris, Digital Entrepreneurship Certificate (http://www.hec.edu/Masters-programs/Non-degree-programs/Certificates-available-to-current-HEC-students-only/Digital-Entrepreneurship/Why-this-certificate) and https://digitalskillsacademy.com/international-bsc-degree

[6]   http://www.broadbandcommission.org/workinggroups/Pages/Digital-Entrepreneurship.aspx

[7]   Women in Digital Bangladesh http://www.widbd.com/

[8]   https://www.technologytimes.pk/telenor-collaborates-with-ministry-of-it-on-digiskills-training-project/

'[DigComp] is a tool to improve citizens' digital competence, help policymakers formulate policies that support digital competence building, and plan education and training initiatives to improve the digital competence of specific target groups. DigComp also provides a common language on how to identify and describe the key areas of digital competence and thus offers a common reference at European level.'[1]

[1]   Vuorikari, R., Punie, Y., Carretero Gomez S., Van den Brande, G. (2016). DigComp 2.0: The Digital Competence Framework for Citizens. Update Phase 1: The Conceptual Reference Model. Luxembourg Publication Office of the European Union. EUR 27948 EN. doi:10.2791/11517

Digital Competence Framework for Citizens (DigComp): Competence Areas

DigComp features five competency areas. Each area contains a number of specific competencies, proficiency levels, the knowledge, skills and attitudes associated with each competency.

1.   Information and data literacy

    1.1. Browsing, searching and filtering data, information and digital content

    1.2. Evaluating data, information and digital content

    1.3. Managing data, information and digital content

2.   Communication and collaboration: interacting through digital technologies

    2.1. Sharing through digital technologies

    2.2. Engaging in citizenship through digital technologies

    2.3. Collaborating through digital technologies

    2.4. Netiquette

    2.5. Managing digital identity

3.   Digital content creation

    3.1. Developing digital content

    3.2. Integrating and re-elaborating digital content

    3.3. Copyright and licenses

    3.4. Programming

4.   Safety

    4.1. Protecting devices

    4.2. Protecting personal data and privacy

    4.3. Protecting health and well-being

    4.4. Protecting the environment

5.   Problem solving

    5.1. Solving technical problems

    5.2. Identifying needs and technological responses

    5.3. Creatively using digital technologies

    5.4. Identifying digital competency gaps

Source: DigComp 2.0: The Digital Competence Framework for Citizens[1]

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[1]   This 48-page document includes multiple examples of how these skills are used, organized by progressively more advanced levels of skill, to provide better meaning for the terms used in the DigComp framework.. https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework

These frameworks are indeed dynamic: DigComp was updated in 2016, three years after its introduction. 'Information literacy' in DigComp 1.0 became 'Information and data literacy' in DigComp 2.0 while 'Communication' was replaced by 'Communication and collaboration'.

Online safety

A core competence in the DigComp framework is online safety and any digital skills strategy importantly should include this. More and more countries are integrating these skills into their school curriculum[9]. And as seen below, online safety skills are also recognized in frameworks that combine 21st century and digital skills as well as in mobile literacy training.

21st century skills

Digital skills take their place within a broader framework, often referred to as '21st century skills'. According to a World Economic Forum report, 21st century skills are comprised of three 'pillars': foundational skills, competencies, and character qualities, as set out in the graphic below. Sometimes 21st century skills are called 'soft skills'[10]. As shown here, digital skills (referred to in the graphic as 'ICT literacy', fall under the Foundation category. This underlines the great importance of the connection between digital skills and other competencies and character qualities – all within an overall system of lifelong learning.

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[9]   See, e.g. the Aqdar E-Safe School programme developed in the United Arab Emirates https://www.itu.int/net4/wsis/stocktaking/projects/Project/Details?projectId=1488379784&hTop=1&popup=1

[10]   Soft skills are also the subject of stand-alone analysis such as the Youth Employment Funders Group, _What Works in Soft Skills Development for Youth Employment?_ http://www.mastercardfdn.org/wp-content/uploads/2017/09/soft-skills-youth-employment.pdf

21st century skills
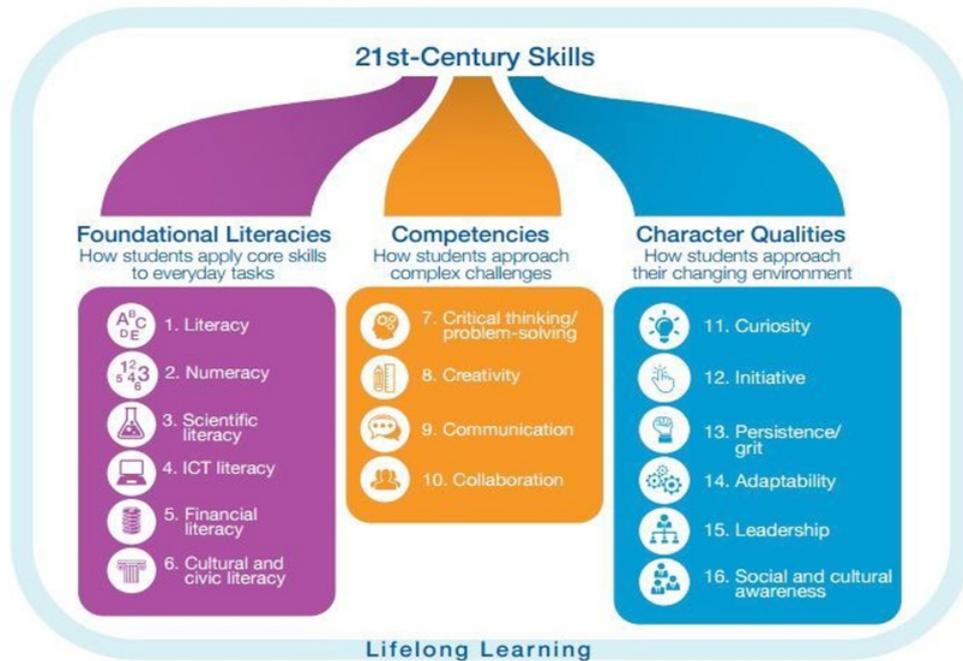
Source: World Economic Forum

Mozilla is one organization that has explicitly designed its framework to embrace 21st century skills. As shown below, each of the skill areas is connected to one or more 21st century skills.[11] Each skill area contains a number of curricular offerings where, for instance, one develops problem-solving and creativity competencies while learning how to code.

Web literacy

Source: Mozilla

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[11]   https://learning.mozilla.org/en-US/web-literacy

The private sector is also identifying the important bridge linking soft and digital skills – an example is the Accenture-Education for Employment online training platform described below.

Competencia is an online soft-skills training platform developed by Accenture Spain and coordinated by Education For Employment in countries such as Argentina, Brazil, Jordan, Morocco, Saudi Arabia, Spain, Tunisia, South Africa and UAE. The partners are developing the next generation of their training platform, +Competencia, that will include digital skills modules and content based on a comprehensive analysis of digital-related soft-skills, identification of new abilities that need to be developed to work in a digital environment and the creation of a training catalogue for digital knowledge. The new training programme will include topics such as the advanced use of mobile devices, understanding different online communication services and social media, and creating Whatsapp groups for work-related purposes.

Emerging and specialized skills

In many respects, emerging and specialized skills represent the direction in which digital skills programmes are heading, and thus offer future-oriented opportunities for countries to consider. Research undertaken in 2016 underlines how critically important the teaching of such skills is at school level: estimates of numbers graduating from coding bootcamps, while encouraging, are falling way below what is needed to bridge the anticipated shortfall in digital skills. Thus if we are to ever achieve scale on developing intermediate and advanced digital skills, such skills need to be integrated into schools' curricula around the world. The topics are: computational thinking, data literacy and mobile literacy.[12]

Computational thinking and coding

Recent years have witnessed burgeoning interest in the teaching of computational thinking as a basic literacy, on a par with reading and writing. Computational thinking is 'a problem solving process that includes a number of characteristics and dispositions. [Computational thinking] is essential to the development of computer applications, but it can also be used to support problem solving across all disciplines, including the humanities, math, and science.'[13] Computation has also been described as 'a way of solving problems, designing systems, and understanding human behaviour that draws on concepts fundamental to computer science. To flourish in today's world, computational thinking has to be a fundamental part of the way people think and understand the world.'[14]

In terms of content, computational thinking involves 'problem solving, examining data patterns, decomposing problems, using algorithms and procedures, making simulations, computer modelling, and reasoning about abstract objects.'[15]

In practice, teaching computational thinking can begin when children are of primary school age, and many countries are doing this as described later in the toolkit. Thus, computational thinking starts at a basic level, but rises through to advanced topics. Teaching computational thinking can be introduced with exercises that require no technology and which then gradually add the use of computers and other devices. As with all skills included in this toolkit, there are many online resources that can be used to teach computational thinking such as Google's Computational Thinking for Educators[16].

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[12] While some stakeholders have labelled data and mobile skills as literacies, it's important to recognize that these labels also cover more advanced skills which are not usually associated with the concept of literacies.

[13] https://computationalthinkingcourse.withgoogle.com/unit

[14] https://www.cs.cmu.edu/~CompThink/

[15] Bocconi et al. 2016. Exploring the field of computational thinking as a 21st century skill. EDULEARN16Proceedings. IATED Academy, pp. 4725-33. https://library.iated.org/view/BOCCONI2016EXP

[16] https://computationalthinkingcourse.withgoogle.com/unit

Source: Shutterstock https://www.shutterstock.com/it/image-vector/concept-thinkingbackground-brain-file-saved-ai10-93075775?src=nW1AvbejghteCrDRZxk9qw-1-71
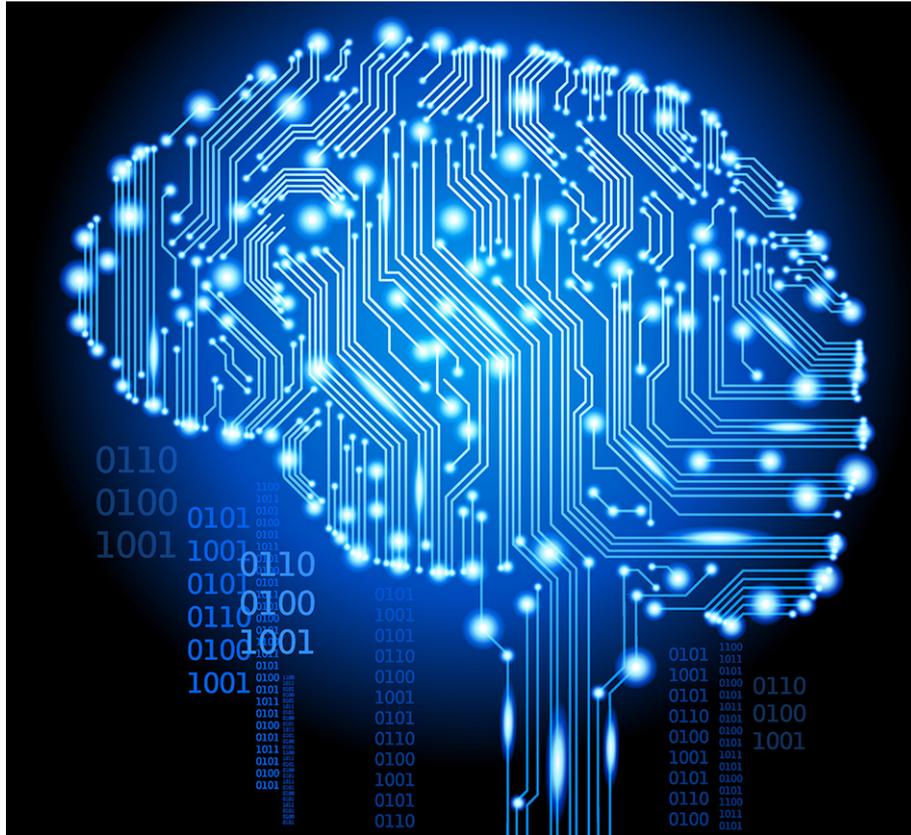
In addition to computational thinking, schools are beginning to introduce coding into their curriculum. This can begin in primary school, using programmes such as Scratch (designed for this purpose) and gradually introducing more advanced coding training. Some school coding programmes focus on women and girls, such as the UNESCO YouthMobile initiative. In addition, there are a number of campaigns and after-school coding clubs where students are introduced to coding, such as Hour of Code. These informal training channels can be tapped to train teachers on how to teach coding. More on the role of formal and non-formal education channels can be found in Chapter 5 below.

Hour of Code has been labelled "the largest learning event in history." The global campaign encourages educators around the world to provide one hour of coding instruction using its online tutorials during national Computer Science Education Week in the United States. The tutorials are offered in 45 languages, and have been accessed by over 100 million students in over 180 countries. As is the approach with most campaigns, the goal of the event is exposure to coding, not proficiency: "the goal of the Hour of Code is not to teach anybody to become an expert computer scientist in one hour. One hour is only enough to learn that computer science is fun and creative, that it is accessible at all ages, for all students, regardless of background."[1]

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[1] https://hourofcode.com/

Source: Shutterstock https://www.shutterstock.com/it/image-photo/digital-binary-data-on-computer-screen-735357409?src=CpaIU1zJpKLKn5gKLzQ4Fw-1-60
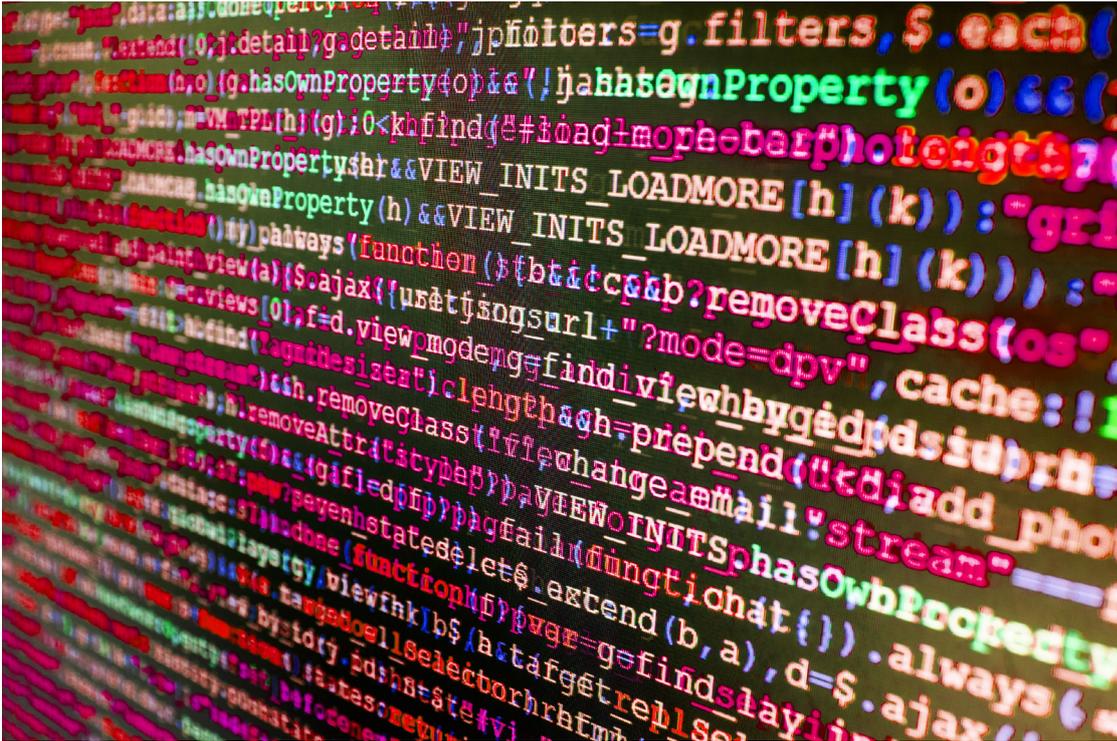
UNESCO YouthMobile is an initiative to amplify global efforts aimed at introducing youth to "computer science programming (learning-to-code) and problem-solving (coding-to-learn)" with a particular emphasis on women. It aims to "provide young people with the high-level skills and confidence to develop, promote, and sell locally relevant mobile apps that solve local issues of sustainable development and provide employment."[1]

UNESCO Youth Mobile

Source: UNESCO

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[1]   https://en.unesco.org/youthmobile

Source: Shutterstock https://www.shutterstock.com/it/image-photo/close-businesswoman-holding-graphs-hand-226597924?src=cluqw6KQ369J2vlCAZvj2A-1-25

Data literacy

People who can derive meaningful information from data are in high demand in every sector, a trend driven by the global explosion in big data and the proliferation of sophisticated tools to manage, analyse, and visualize data. Some observers suggest that in 10 years, data experts will have replaced computer experts as being a desirable profession.[17] As such, people with data skills will be found in every industry-- from SMEs to large corporations-- just as people with computer skills are now needed across all job sectors. While data scientists with advanced mathematical and statistical expertise represent the top tier, many organizations are demanding data-based literacy and specific skills from employees:

- Knowing what data is appropriate for a particular purpose

- Interpreting data visualizations, such as graphs and charts

- Thinking critically about information yielded by data analysis

- Understanding data analytic tools and methods, and when and where to use them

- Recognizing when data is being misrepresented or used misleadingly

- Communicating information about data to people lacking data literacy, an ability sometimes referred to as data storytelling[18]

Citizens too increasingly need these skills. Governments, through the Open Government Partnership[19] and other initiatives, are making more public data available and encouraging people to analyse and glean insights to improve public services and accountability.

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[17]   Dave Fowler, Road to the Future Paved With Data Literacy, Wired, August 2013
[18]   http://whatis.techtarget.com/definition/data-literacy
[19]   http://www.opengovpartnership.org/

Mobile literacy

Of the five billion people with mobile phones, nearly half (47 percent) "mainly use their device to place a voice call or send a text message."[20] As increasing numbers of these people move from feature phones to smartphones, and as the next billion comes online, many will skip the stage of using personal computers (PCs) and feature phones entirely, moving directly to powerful handheld computers, i.e. smartphones. There is a critical need to bridge the gap between using a phone for basic functions and using sophisticated smartphones. Mobile literacy has emerged to meet this need by identifying the necessary digital skills smartphone users need in order to optimize their mobile internet experience.

Chart 2.1: Global active mobile-broadband subscriptions, total and per 100 inhabitants, 2007-2017*
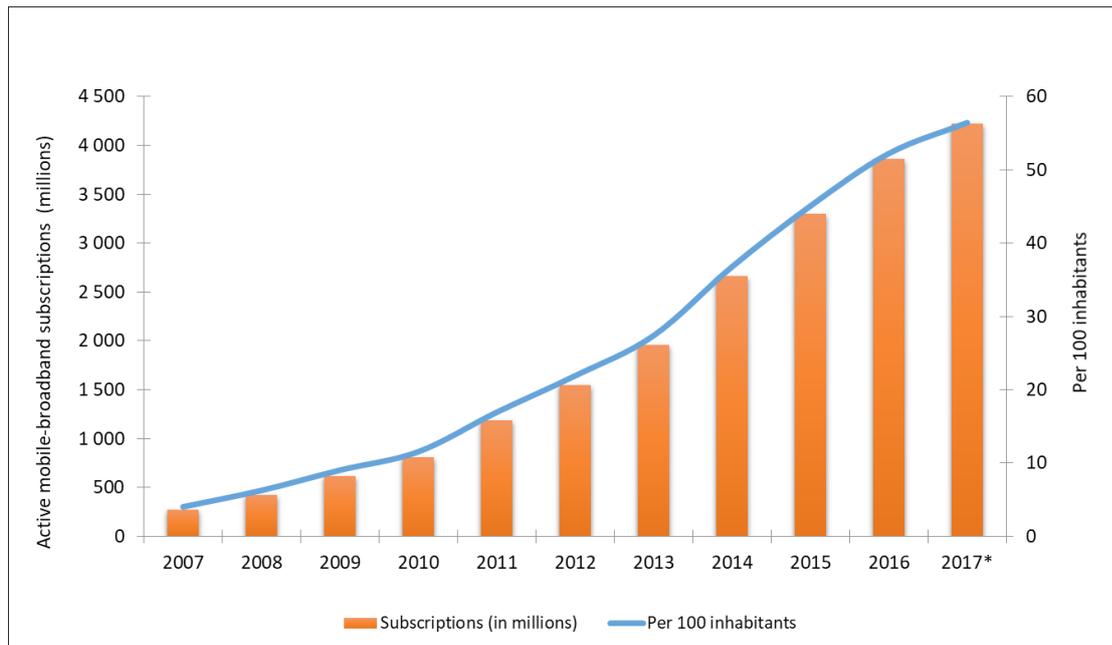
Note: *ITU estimate.

Source: ITU, Measuring the Information Society 2017

Two forces are driving mobile literacy efforts. Firstly, people everywhere are using their smartphones to learn, conduct business, use financial and government services, and engage in other productive activities. Indeed, the smartphone's mobility and its ease of use through apps are fuelling countless opportunities. Secondly, there is a tendency for smartphone users to consume more information than they produce, and engage in more social than "serious" activity compared to PC users. Furthermore, many educational and work functions still require a PC – for example, activities such as writing reports and developing apps are far easier to complete on a PC.

The development of a mobile literacy curriculum is still in its infancy. Three examples are:

• Mozilla's Digital Skills Observatory curriculum;[21]

• GSMA's Mobile Internet Skills Training Toolkit;[22]

• the University of Washington Technology & Social Change Group's (TASCHA) Mobile Information Literacy curriculum.[23]

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[20] GMEI 2017: Global Mobile Engagement Index. GSMA. February 2017
[21] https://mozillafoundation.github.io/digital-skills-observatory/
[22] https://www.gsma.com/mobilefordevelopment/programme/connected-society/mobile-internet-skills-training-toolkit
[23] http://tascha.uw.edu/mobile-information-literacy-curriculum/

Do Facebook users know they are using the internet?

Research conducted across eight South and Southeast Asian countries by LIRNEasia suggests many people view Facebook and the internet as different platforms.[1] What implications does this have for ensuring people can realize the broadest benefits of the internet? Mobile literacy exposes people to multiple tools and platforms so that they can make better use of the entire internet, including a range of websites, apps and tools.

Internet users and Facebook users per 100 people
■ Internet users ■ Facebook users

Quartz | qz.com   Data: LIRNEasia

Source: Quartz[2]

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[1]   http://lirneasia.net/2014/08/more-facebook-users-than-internet-users-in-south-east-asia/
[2]   https://qz.com/333313/milliions-of-facebook-users-have-no-idea-theyre-using-the-internet/
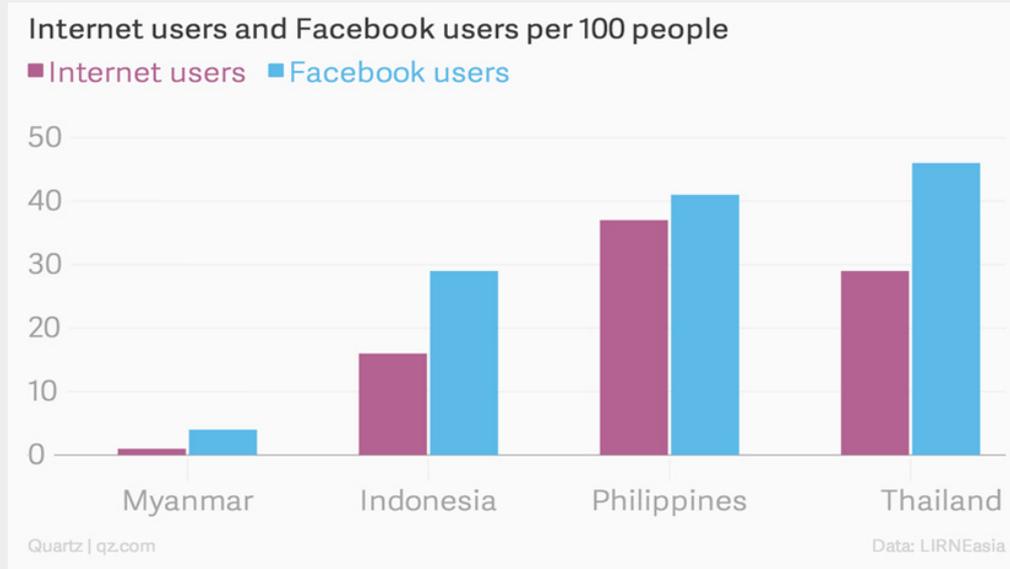
While each curriculum has been developed for a specific context (Kenya, India, and Myanmar respectively), current work is exploring the transferability of skills to other contexts. The GSMA curriculum, for example, includes a guidebook used to localize the training in countries such as Rwanda.[24] And TASCHA's curriculum has been adapted for Kenya, incorporating some of the materials created by Mozilla and GSMA. These resources are available for broader use, recognizing that more work is needed to improve them for different uses and contexts. The TASCHA resources are provided on an open source basis in order to encourage such adaptation and improvements.

One feature of the GSMA toolkit is that it has both full length, in-depth sessions that require 45-60 minutes per session to complete, and "bitesize" modules that can be completed in 2-3 minutes. The bitesize modules can be taught by mobile operators' sales staff, expanding the universe of digital skills trainers.

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[24]   https://www.gsma.com/mobilefordevelopment/programme/connected-society/mobile-internet-skills-training-toolkit-tigo-rwanda-pilot-evaluation

Topics covered by three mobile literacy curricula[25]

Mozilla*	GSMA**	TASCHA***
1: The Smartphone Ecosystem Learn the basics of how smartphones and the internet work together to deliver apps, information, and messages to and from your smartphone.	**1: Introduction to the Internet** Simple explanations to help answer some of the most common questions about the internet.	**1. The Mobile Internet** Smartphone and Internet basics, connecting to the Internet, and downloading apps.
2: All About Accounts Learn how to set up new accounts and create passwords that keep them safe and secure from people who want to impersonate you or steal your data.	**2: WhatsApp** Uses WhatsApp as an 'entry point' to build on from what people know, whilst introducing the benefits of communication via the internet and the skills needed for this.	**2. Getting Started with Apps and Security** How to set up accounts, create strong passwords, and avoid online scams.
3: Exploring, Searching, and Downloading Learn what is possible online by exploring, searching, downloading and using the web and mobile applications.	**3: YouTube** Builds on the positive regard that people in India have for audio visual channels whilst introducing the skills necessary to use the mobile internet.	**3. Searching, Evaluating, and Using Content** How to use search engines, recognize different types of web content, and identify trustworthy sources.
4: Solving Problems with your Phone Use your phone to be more creative, solve problems and be more productive.	**4: Google Search** Allows people to find content that is relevant to them on the internet.	**4. Working Online with Others** Online etiquette, such as working in collaborative online environments.
	5: Safety & Cost Staying safe and the cost of using the mobile internet are covered within each of the WhatsApp, YouTube and Google modules.	**5. Making mobile phones and mobile Internet work for you** How mobile Internet can help solve everyday problems, how to use locally relevant, secure apps.
		6. Using Library Resources on Mobile Phones Library resources and how to use them on a smartphone.

* Digital Skills Observatory, Mozilla. Available at http://mozillafoundation.github.io/digital-skills-observatory/

** Mobile Internet Skills Training Toolkit, GSMA. Available at http://www.gsma.com/mobilefordevelopment/programmes/connected-society/mistt

*** Mobile Information Literacy Curriculum, Technology & Social Change Group, University of Washington Information School. Available at http://tascha.uw.edu/collections/mobile-information-literacy-curriculum/ on an open license framework.

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[25]   Descriptions are quoted directly from each of the respective websites.

Chapter 3: Stakeholder engagement: aiming to build broad representation

Given the degree to which digital skills touch every aspect of work and life, many countries' goal is to ensure that a broad, representative group of stakeholders engage in the process of developing a digital skills strategy. This chapter outlines some of the most common stakeholders that should be engaged – but please note that this is not an exhaustive list. In particular, since digital divides tend to exacerbate other social divides, it is crucial that groups that are often excluded from policy-making processes have a voice. This chapter also identifies, a range of models that can engage stakeholders, a tool to facilitate the formation of a country's stakeholder group and guidance on governance and working methods for such groups.

It bears repeating that there is no single approach to stakeholder engagement, and that the development of a digital skills strategy should be undertaken within a broader context.

> "The policy challenge is multifaceted. First, is a wide spectrum of policy areas that should be addressed in a holistic manner, such as infrastructure, education and skills development, the labour market, competition, science, technology and innovation and fiscal issues, as well as trade and industrial policies. This requires effective cross-sectoral collaboration both within the government and with other stakeholders. Governments should seek to seize opportunities presented by the digital economy in support of relevant sustainable development objectives. Coordinating cross-sectoral policies is challenging for any country, but especially for those with very limited resources."[26]

Cross-sectoral collaboration benefits from input across economic sectors and a range of stakeholders.

Leadership: An entity is needed to lead and coordinate the stakeholder engagement process. Countries have taken different approaches to this. Some have identified a particular ministry; others have assembled a commission or built a national coalition. Whatever the approach, it is important for the entity to have convening authority to bring together the relevant stakeholders.

Government agencies: Since digital skills are needed to participate effectively in every aspect of life and work, it is important to engage all relevant ministries and departments in shaping a digital skills strategy. It is common for the following to be included:

- Digital Economy/ICT/Telecommunications;
- Labour/Workforce development;
- Education;
- Culture/Public libraries;
- Health;
- Rural development.

Educational institutions: Educational institutions play a critical role since they provide learning pathways for such a wide proportion of a country's population. Most countries take steps to incorporate digital skills training into their educational institutions. This entails having representation from all levels of education, including primary and secondary schools, technical and vocational institutions, colleges and universities.

Stakeholder engagement: Aiming at building broad representation

STAKEHOLDER ENGAGEMENT : AIMING AT BUILDING BROAD REPRESENTATION

Given the degree to which digital skills touch every aspect of work and life, the goal of many countries is to ensure that a broad and representative group of stakeholders engage in the digital skills strategy development process.

The figure below showcases the interaction of the different entities, in colored gears, and economic sectors, in gray.
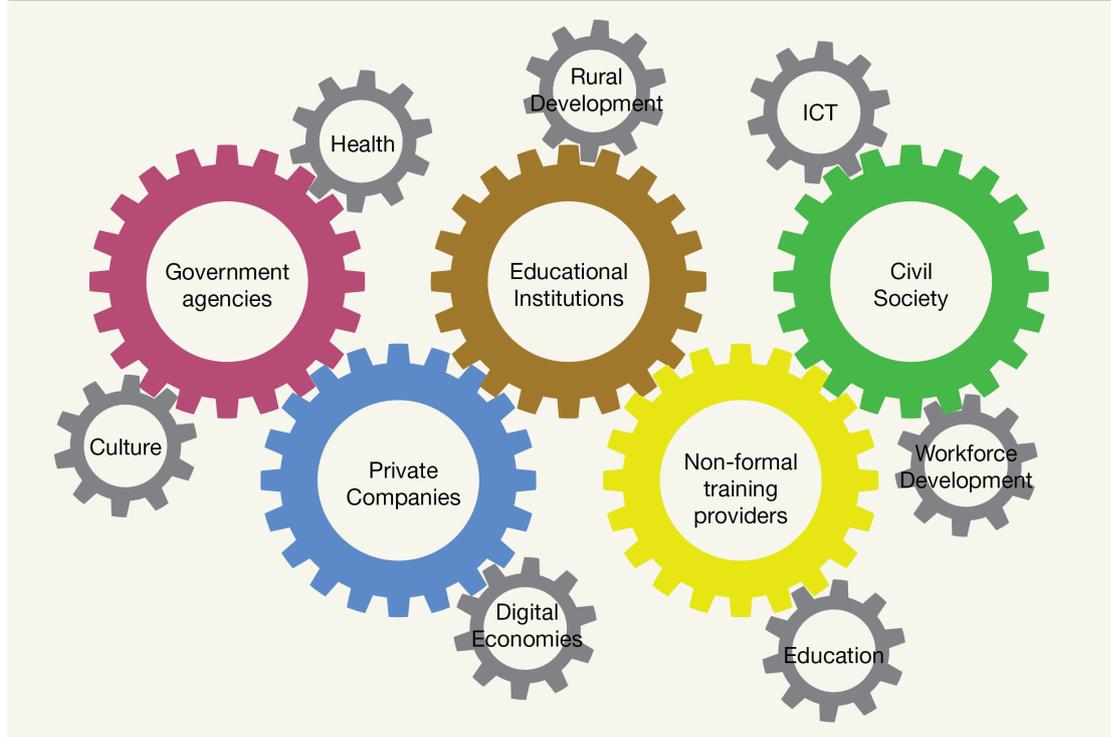
Source: ITU

Private sector: It is very important to engage the private sector, not only to ensure that digital skills plans meet workforce needs and companies' technology deployment plans, but also to involve them in the planning. For example, the private sector may be positioned to provide skills training, including on company online platforms, or incentives for their staff continually to develop their digital skills – an important role for reskilling the existing workforce when dislocations occur due to automation and other job-replacing technologies. The international private sector too can play a role as foreign technology companies are often keen to contribute to building a country's digital skills base. And, mobile operators are becoming increasingly involved in digital and mobile literacy efforts as they recognize that it makes good business sense to support more people in acquiring digital skills.

Civil society: The involvement of civil society is just as important. Civil society organizations that represent the interests of ethnic minorities, persons with disabilities, youth, women and other target or marginalized groups can ensure that digital skills planning meets the needs of these populations. Public and community libraries, NGOs, and community centres offering educational programmes are also important actors because of the role they play in providing lifelong learning opportunities in many countries.

Non-formal providers of digital skills training: Non-formal training providers such as commercial and social enterprise coding bootcamps, volunteers who have taught digital skills as part of a national, regional or international digital skills campaign, as well as tech clubs, hubs and maker spaces – all of these can provide informed advice and guidance on developing a national digital skills training programme and are likely to play a key role in implementation. For more information about makerspaces and other non-formal providers of digital skills training, see Chapter 5.

Models for stakeholder engagement

There are different approaches to stakeholder engagement, including industry and expert councils, coalitions, task forces and more informal methods such as organizing national or regional forums on digital skills.

Coalitions and councils

Coalitions and councils are both effective mechanisms for organizing and sustaining stakeholders in digital skills efforts from strategy development through implementation, review, and updating. These groups can be responsible for such areas as:

- reviewing progress and needs of specific policies and programmes;

- monitoring new technological developments;

- capturing and forecasting workforce needs;

- assessing new digital skills learning opportunities;

- identifying new partners;

- joining new regional or global campaigns;

- developing new initiatives.

Coalitions are a popular way of uniting organizations' efforts across sectors and industries toward a common goal. These cooperative alliances are also advantageous when wide-scale and broad-based support is imperative for challenging the status-quo. Coalitions can be formed at any level, local to international, as coordination at any of these levels can support progress at any of the other levels. For example, local momentum can spread to other localities and up to the national level, while international momentum can support initiatives at the national and subnational level.

Some countries may want to start by joining a regional or international coalition since this approach offers the opportunity to become part of an already existing effort.

In addition to the European Union-wide coalition, the majority of European Union member states have created national or regional digital skills coalitions promoting more employer-led training, certification, curriculum improvement and awareness raising on the importance of digital skills[1].

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[1]   https://ec.europa.eu/digital-single-market/en/national-local-coalitions

Another approach is to leverage the initiative and political will of a municipality or other local administrative unit where there is more fertile ground for bringing together the relevant stakeholders.

The **Digital Skills and Jobs Coalition Initiative**[1], as part of the European Commission's New Skills Agenda for Europe, has invited all types of organizations in the EU to become members as long as the organizations advance the objectives and principles listed in the Coalition's charter. As such, "members are encouraged to pledge for action to train more digital experts, re-skill and up-skill the labour force and provide citizens with the digital skills they need for their lives." The Digital Skills and Jobs Coalition is not just symbolic; it has also been designed to work closely with member states, assisting them as they determine their own national digital strategies and goals, providing guidance and technical assistance, and spotlighting best practices (potentially scalable models) through the European Digital Skills Awards. Together, the Coalition will help drive progress on four goals to fill vacant digital jobs in Europe:

- to train one million young unemployed people;

- to upskill and retrain the workforce;

- to modernize education so that all students and teachers can use digital tools and materials and continue developing their skills throughout their lives;

- to "reorient and make use of available funding to support digital skills and carry out awareness-raising about the importance of digital skills for employability, competitiveness and participation in society."

[1]   https://ec.europa.eu/digital-single-market/en/digital-skills-jobs-coalition

Task forces and collaborations

Some countries may choose to begin with a task force or project-oriented collaboration. These are typically focused on a specific goal and may be more time-limited. The purpose of a task force may be to initiate the development of a digital skills strategy, while expecting this to become a more comprehensive process down the road. Alternatively, the purpose could be to focus on a specific digital skills programme to model a collaborative approach that could then be replicated or scaled.

In Kenya, the Kenya National Library Service has collaborated with the Communications Authority of Kenya and a range of local and international partners to provide digital skills training through Kenya's public library network. Partners include UNESCO, Goethe Institute, EIFL (Electronic Information for Libraries), the Good Things Foundation, and the University of Washington.
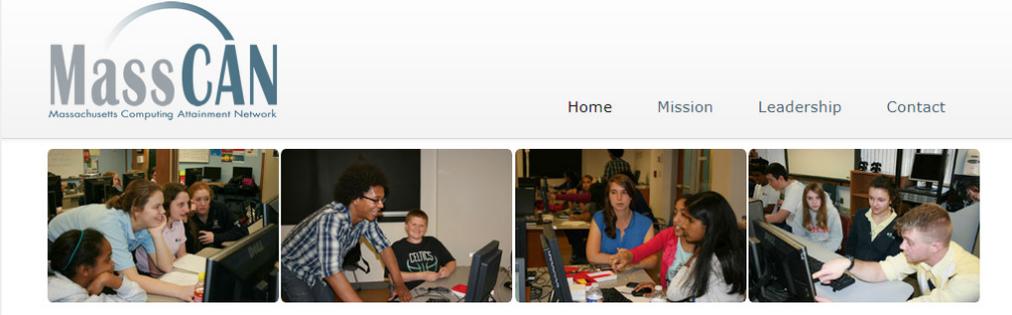
MassCAN, the Massachusetts Computing Attainment Network, is one example of a successful subnational coalition that was created to get more of the state's primary and secondary students interested in computer science and related disciplines. The aim has been to increase the pipeline of people entering the computing technology workforce, allowing the industry to grow and thrive in the state. The collaboration started as the Talent Working Group, which was comprised of tech companies, education institutions, and local and state government, and was tasked with gaining a practical understanding of the problem and proposing solutions. Within three years the group was able to create two programme teams, convene several youth events, develop white papers, hold workshops, contribute to the founding of a chapter of the Computer Science Teachers Association, and forge new relationships with other actors at the state and national level. Within another couple of years, the Computer Science and Digital Literacy standards, prepared by MassCAN to improve the quality of primary school and secondary school digital skill instruction, was approved by the state government. The standards are being used to modernize instruction throughout the state, and have also inspired similar developments in other states.

Source: http://masscan.edc.org/

Digital skills forums

Another approach is to organize digital skills forums, both to create communities of practice and incentivize action. Existing providers of digital skills training can participate by sharing their challenges and solutions, fostering communities of practice. Many training providers share the same challenges such as developing relevant curricula, finding qualified instructors and operating sustainable business models that offer affordable training to their students. Others are trying to expand into new areas such as the Internet of Things, Artificial Intelligence, Big Data and Cloud Computing. Sessions covering a range of topics can be organized with the goal of sharing good or promising practices and improving training programmes.

Such forums can include the granting of awards to providers of digital skills training, the private sector and government actors to incentivize the implementation of the training. The awards, in turn, can support the attainment of goals established by a national digital skills strategy such as numbers of different population groups trained, type of skills training provided or improvements to school curricula. Good practices and resources identified in the forums can be published and shared with digital skills stakeholders and providers to improve training outcomes.

African Forum on Youth skills and enterprise in the digital age

The African Forum on Youth skills and enterprise in the digital age (Tunisia, 18-19 April 2018) is an example of the type of event that can be organized to bring together a broad range of stakeholders. The purpose is "to showcase, share and discuss comprehensive and innovative TVSD/TVET [Technical and Vocational Skills Development, and Technical and Vocational Education and Training] models and programmes that aim at developing the leadership and digital skills of the youth and equipping them with the necessary knowledge, tools and know-how to design marketable products and services and, therefore, create sustainable enterprises and generate employment."[1]

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[1]   http://www.digitalskills4africanyouth.org/en

Tool: stakeholder engagement

The purpose of this tool is to help create a country's stakeholder group that will be responsible for developing and implementing a digital skills effort, whether it be a comprehensive national strategy or a specific digital skills initiative.

Lead entity

Identify the body that will lead and coordinate the digital skills strategy/initiative, and describe the rationale.

Stakeholders list

List each government agency, private sector group, civil society organization that should be involved in the digital skills strategy/initiative. For each entity describe the reason it should be involved and what role it would play. Also, capture any unique strengths of any of the stakeholders.

23

Name	Role

Stakeholder coverage

Next, consider the extent to which the stakeholders represent the priority population groups and issues. Are there any gaps? If gaps exist, how will those interests be represented?

Governance and working methods

Lastly, it is prudent to establish governance mechanisms and working methods for the group. This is particularly important for more formal arrangements such as a coalition or council. This can be a light mechanism such as the Digital Skills Charter[27] used by the European Commission or based on similar rules governing other stakeholder councils or coalitions used in-country or borrowed from other countries. Typically, the charter for stakeholder bodies would include elements such as mission or purpose; the legal authority for establishing the body; the name of the convenors; the scope of the body's work; its values; appointment and identification of members, chair and co-chairs and their terms; reference to any rules to be applied to its meetings such as quorums and confidentiality; the ability to create working groups and procedures related to public comment[28].

Describe governance and working methods

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[27] https://ec.europa.eu/digital-single-market/sites/digital-agenda/files/digital_skills_and_jobs_coalition_members_charter_0.pdf

[28] Readers can search online for many examples of stakeholder advisory committee or council charters across sectors.

Chapter 4: Existing policies and needs: making an inventory

Many countries have policies and programmes aimed at advancing the ICT sector. These might include providing e-government services, improving healthcare with ICTs, equipping schools with computer labs, offering e-agricultural programmes, implementing digital literacy missions, promoting digital transformation plans and many other priorities. Sometimes these policies are coordinated. More often they are developed independently. The purpose of this chapter is to capture and assess these policies and programmes as an important starting point for the development of a comprehensive digital skills strategy. This chapter also includes tools related to inventory and to the assessment of existing policies and programmes.

There are generally three categories of policies:

1. those focused on ICTs;

2. those focused on a particular sector;

3. national development plans that typically cover both and articulate a vision and goals for the country in response to key trends and other changes in the macro environment, such as Namibia's Vision 2030[29] and its annual National Development Plan[30] (increasingly, these plans are being linked to the Sustainable Development Goals).

ICT-focused policies (examples)	Sector-focused policies (examples)
• Digital economy	• Education
• Telecom/mobile policies	• Workforce development
• Broadband	• Rural development
• Digital inclusion	• Agriculture
• E-Government	• Health
• Universal service and access funds	• Public libraries
	• Youth
	• Women

National development plans
- Vision
- Goals
- Key trends

These policies and programmes may or may not address digital skills, something that the Tool at the end of this chapter will help assess. For example, the inventory may reveal that digital skills are covered in the education policy, but not in ones covering rural development or healthcare.

Tool: inventory and assessment

The purpose of this tool is to take an inventory of existing policies and programmes, identify a country's needs, and conduct an overall assessment of the degree to which current policies and programmes are meeting that country's needs.

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29 Namibia Vision 2030 http://www.npc.gov.na/?page_id=210
30 Namibia National Development Plan http://www.npc.gov.na/?page_id=18

M'lang CeC, North Cotabato

[DOST ICTO MC3] MC3 Team explains the Tech4ED rationale to Gov. Steve Chiongbian Solon at Sarangani provincial capitol

Philippines Tech4Ed

The Technology for Education, Employment, Entrepreneurs, and Economic Development (Tech4ED) Project is a national digital inclusion initiative focused on establishing eCenters that provide e-government and ICT-enabled services in communities with minimal or no access to information and government services. In addition to establishing physical access points, Tech4Ed encompasses content development, capability building, and advocacy and promotion.

Source: http://dict.gov.ph/tech4ed/

National Development Plans and Sector Policies

List each relevant existing national development plan and policy, along with the year that the plan and policy was most recently reviewed or updated. List also the lead responsible agency, digital skills coverage in the plan or policy, and an overall assessment of how effectively the plan or policy has been implemented. Include national plans with a digital skills component as well as both ICT-specific and sector-specific policies. An example might be a policy to expand digital skills in secondary schools, last updated in 2002, led by the ministry of education, covering basic digital skills such as computer operations and internet search.

Name of policy	Year	Lead agency	Digital skills coverage	Overall assessment

Needs

Next, at a high level describe the country's needs as it relates to digital skills. Do particular industries express a need for more qualified IT workers? If so, with what types of skills? Are particular population groups currently not accessing important government services because they don't have the right skills?

Factors that affect demand for digital skills	How are these factors expected to change over the next five to ten years in your country?	How might these changes influence the demand for digital skills in your country?
Demographic trends E.g., retirement and replacement, youth unemployment		
Technological changes E.g., automation		
Business trends E.g., economic expansion and retraction, employer surveys, employment data, future scenarios		
Trade E.g., trade agreements, export sectors		
Industry policies E.g., investment in new technologies, hiring practices		
Shift to a greener economy E.g., alternative energy		
Other...		

Overall assessment

Next, provide an overall assessment of the current digital skills policies with regard to your country's needs. For this exercise, a SWOT analysis may be most useful. Strengths and weaknesses describe characteristics internal to the country. Opportunities and threats describe elements in the external environment. The analysis should lead to identification of new or updated policies that better address the country's needs.

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Strengths   *Weaknesses*

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Opportunities   *Threats*
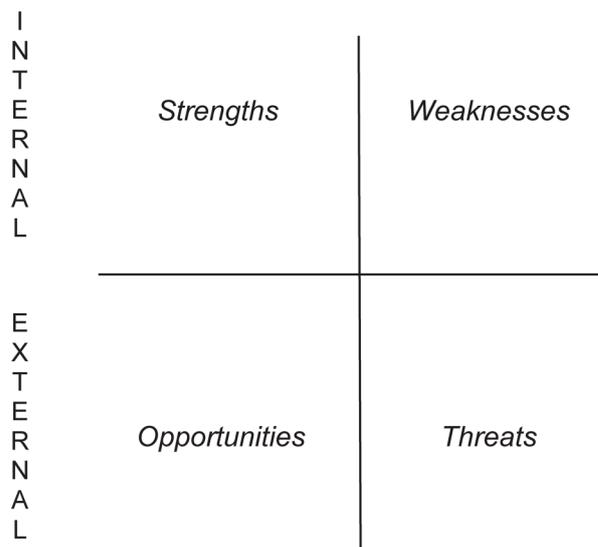
New or revised policy or policies

Next, at a high level identify the need for new and/or revised policies to ensure the country's digital skills needs are addressed. Identify the focal point(s) responsible for developing such draft policies and conducting advocacy to adopt them.

Chapter 5: Basic and intermediate skills: ensuring everyone has the digital skills needed to succeed in work and life

National digital skills strategies need to ensure that everyone has the basic digital skills to function in society as well as opportunities to gain intermediate skills that improve employment prospects and enable more meaningful uses of technology. This is the focus of this chapter. It includes common challenges, successful approaches and sets out a range of channels for basic and intermediate skills delivery – as well as tools to identify such channels and programmes that may exist already. Chapter 6 covers advanced skills.

Girls learning basic and intermediate digital skills at Girls in ICT Day Geneva event

Source: ITU

Developing opportunities for people to learn basic and intermediate digital skills begins with establishing clear goals and target groups (see Chapter 6). Popular goals at this stage include: providing school children with early exposure to digital skills and computational thinking, providing young people with the skills needed to develop successful careers in the digital economy, and creating multiple pathways for adults to build skills at different stages of life. All of these could feed into an even larger national objective linked to fostering the growth of the digital economy or leveraging the digital transition.

In examining how various countries have pursued such goals, this chapter looks at a number of common challenges and successful approaches for building basic and intermediate skills. It then shows how countries have utilized formal channels (e.g. schools) and non-formal educational channels (e.g. NGOs and public libraries) to implement innovative digital skills programmes. The solutions are provided as examples and options. Countries are encouraged to identify and adopt strategies that fit realistically in their own environments and match their objectives. Some are more structural, such as those related to education, requiring systemic change that, while potentially more difficult and costly to achieve, would lead to higher impact –while other solutions may be simpler to implement,

offering initial quick wins for promoting digital skills. Countries can also consider existing channels which provide digital skills training and which can facilitate initial implementation as discussed below.

Common challenges

- *Scaling and sustainability.* Many training programmes only achieve small-scale results while most citizens receive no or outdated digital skills training. Moreover, gains made in broad-based strategies will fade quickly without ongoing efforts to ensure associated programmes and initiatives continue evolving. Where provided commercially, this includes identification of sustainable business models. Long-term viability must be planned for from the outset.

- *Affordability of training*. Training programmes need to be provided through models that make training affordable for trainees. Otherwise, the cost of attending can prove prohibitive, particularly for young people and jobless adults.

- *Qualified instructors*. Teachers and other instructors will likely require training to bolster their technical skills and learn how digital skills can be applied in order to address the skills mismatch between what institutions of learning provide and what employers and citizens need for work and life.

- *Infrastructure*. A variety of physical resources will be needed. Most often, digital skills programmes require physical venues with space, electricity, connectivity, and current/updated equipment.

- *Relevant curriculum*. Whether curricula are adopted from an existing source or created in-house, training material must be critically assessed to ensure it covers needed and appropriate skills, competencies, and tasks – required not only for now but further into the future.

- *Adapting and innovating*. Programs and curricula will need to be updated as technology and the workforce change. Plans for updating curriculum need to be developed and implemented.

- *Gender divides and inequalities in skills development.* Persistent gender, age, and other divides around ICT usage has led to fewer opportunities for women, persons with disabilities, the elderly, and other marginalized populations. Most digital skills training programmes are not tailored to the needs of these groups.

Successful approaches

- *Integrating soft skills and entrepreneurial/business skills development into digital skills educational and training programmes*. To succeed in the digital economy, people will need basic digital skills related to the effective use of technology, as well as soft skills necessary to ensure collaborative and effective work. Entrepreneurial/business skills are likewise important, as students and trainees with the right knowledge, skills, and entrepreneurial mind-set can find opportunities to start a new business. By building these skill-sets in a complementary way, learners will be more effective when applying their skills in the real world.

- *Incorporating basic digital skills, coding and computational thinking into schools*. Instruction in basic ICT skills, coding and computational thinking can be a part of school curriculum at all grade-levels. These foundational skills will enable young people not just to use their skills, but also to write the programmes and create the new technologies that drive change – and countries can achieve scale.

- *Extending basic, intermediate and advanced digital skills beyond schools.* Job training programmes and other initiatives that target out-of-school youth and adults allow participants to learn a range of digital skills – such as new coding languages – to keep up with technological progress as they advance in years or experience.

- *Instituting dynamic, peer-learning instruction*. Over the last decade, interactive and peer-driven instructional approaches have gained tremendous momentum across many disciplines, and especially for digital skills training. This style of instruction fosters confident problem-solving

and the creative, collaborative mind-set valued in the digital economy. For example, instructors can incorporate resources for learning to code that allow learners to create their own games and apps. These models can be used both in school programmes as well as in programmes for out-of-school youth and in lifelong learning programmes for adults.

- *Forming cross-sector partnerships.* Most digital skills strategies involve a range of partners who can leverage their unique strengths in achieving the goals of the national strategy. For instance, infrastructure can be leveraged through partnerships with libraries, tech hubs, makerspaces, NGOs, and after-school clubs. Partners often include organizations from the government sector, the private sector, NGOs, academia (see Chapter 3) and non-formal training providers. (For more information about the role of libraries, makerspaces and other informal channels, see Chapter 5.)

- *Develop sustainable, affordable cost structures.* The most effective way to implement this approach is to integrate digital skills into national education programmes that are provided to all students, for free or where employers include upskilling and reskilling as a job benefit, making sure of course to allocate budget for such programmes. Commercial skills providers can employ strategies such as charging employers a placement fee – or can set up systems where students re-pay their training fees over time once they secure a job. Governments can also consider funding the provision of job-ready digital skills through their unemployment or other government benefits. They can conduct a cost analysis, for example, on the relative costs of funding job-ready digital skills provision and paying on-going unemployment benefits to determine if it makes financial sense to redirect unemployment funds for such training.

- *Upskilling instructors*. Many countries are taking steps to equip teachers, librarians, and other instructors with the requisite skills to use technology and to teach digital skills in new, engaging and hand-on ways that ICTs make possible. Strategies for doing this include putting teachers through short-term training courses, team teaching, pairing community or private sector experts – for example pairing trainers from non-formal training providers with qualified teachers – as well as using train-the-trainer models. To make these strategies more effective, school administrators can include additional measures. These might include ensuring teachers are allowed enough time to learn new skills outside working hours, providing them the support needed during and after the training to ensure a smooth transition, and providing incentives to teachers such as additional pay.

- *Use existing infrastructure, upgrading it when necessary.* Where they exist, schools, public libraries, and community centres that are connected to the internet and equipped with computers or other digital devices, can be leveraged to provide digital skills training to a wider audience. Furthermore, in low bandwidth environments, some cloud-based learning platforms can provide offline access and synchronization. Public funds often need to be earmarked to fund infrastructure improvements, maintenance, and upgrading when technology needs replacement. Countries that have not yet invested in connecting and equipping schools, libraries and community centres can also consider doing so to leverage the opportunity to support their citizens to benefit from the digital economy.

- *Deploy makerspaces.* As described below makerspaces can play a role in developing advanced digital skills. They can also be used by students of all ages to test the new basic and intermediate skills they learn in school. Makerspaces don't have to procure expensive equipment but can also use toys and microcontrollers. (For more information about makerspaces, see Chapter 5.)

- *Adapting programmes to meet changing needs.* Digital skills training programmes of course will need to adapt over time. This requires regular monitoring and refreshing. (See Chapter 10). In the near future, big data is likely to play a role in anticipating new digital skills needs.

- *Obtain input from industry and employers*. It is very important to close the gap between the needs of the private sector and what students learn either in school or in other skills training programmes. The private sector can provide critical guidance to enhance the vibrancy and relevancy of digital skills strategies. For example, programmes can follow the coding bootcamp

model of creating industry councils to stay current on which ICT skills are needed both now and into the future. E-government service providers can similarly provide feedback on whether citizens taking basic digital skills training are well equipped to complete online forms or conduct other e-government activities.

- *Leveraging existing education, training curricula and tools*. There are myriad resources that have been created by organizations and collaborations, much of it free or low cost. (See Chapter 9)

Chapter 7 below identifies strategies to create opportunities for under-represented populations.

Formal and non-formal education channels

A country needs to identify the media through which it will execute these strategies, whether these be long-standing institutions or flexible community organizations. As formal education channels, primary and secondary schools reach people at a formative stage in their lives, and thus are ideally positioned to instil skills and concepts that benefit from early exposure to digital technologies. As non-formal education channels, lifelong learning programmes at public libraries, community centres, and other community venues, reach people at different stages of their lives. When developing a channel strategy, it's important to consider not only where people currently go, but also where curious learners could go if a digital skills programme were available.

Formal education: primary and secondary schools

Equipping schools with computers and upskilling teachers has been a mainstay of ICT and education programmes for many years.[31] Schools and teachers play a vital role in digital skills development, not just through providing early exposure to computers, software, and the internet, but also by instilling the kind of thinking skills that shape students into curious and adaptable lifelong learners. Additionally, education systems have the ability to make widespread changes at the national level given the breadth of territory they cover and the numbers of young people they reach.

In most countries the formal education sector is slow to adopt curricular changes, a situation that has an especially negative impact in digital skills education given the rapidity of technological advance and changing employment needs. This highlights the need for countries to adopt flexible curriculum and accreditation guidelines. Even when such changes in policy are not immediately achievable, countries can make important strides by, for instance, participating in Hour of Code or other campaigns, organizing maker activities, as well as using a range of online resources such as Khan Academy (see Chapter 9).

"Inspiring all Australians in digital literacy and STEM" is changing the way digital skills are taught in K12. The multipronged programme includes: upskilling teachers, upskilling students, facilitating partnerships with industry (namely, STEM professionals), and expanding early learning initiatives that include STEM activities.[1] "Inspiring all Australians" also offers digital literacy school grants "to launch projects that demonstrate innovative methods for driving enhanced digital literacy in schools."[2] The grants are open to professionals in all sectors, and is drawing the attention of those working in NGOs and universities to see if the models they have developed will scale to formal learning settings.

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1   For example, http://csermoocs.adelaide.edu.au/
2   http://education.gov.au/digital-literacy-school-grants-dlsg

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31   For example, http://blogs.worldbank.org/team/michael-trucano

Source: Shutterstock https://www.shutterstock.com/it/image-photo/children-learn-programming-sofia-bulgaria-march-479124775?src=xkyXMo7WOrOQXdA_5XzCxQ-1-28

Singapore's Code for Fun Enrichment Program runs in all elementary and secondary schools. It builds both structured and creative thinking by introducing students to visual-based programming using Scratch, while incorporating related concepts using robotic kits (Lego WeDo, MoWay) and microcontrollers (Arduino and Raspberry Pi).[1] Other approaches to computational thinking are being developed for pre-school children, whereby games and videos teach children how to deconstruct problems into small pieces and how to develop step-by-step solutions.[2]

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[1]   https://www.imda.gov.sg/imtalent/student-programmes/code-for-fun
[2]   https://www.techinasia.com/jules-school-of-fish-preschool-computational-thinking

Kenya is addressing the challenge of schools without computers by converting a bus into a mobile and solar-powered ICT classroom. The Craft Silicon Foundation's Mobile Lab is equipped with 34 computers and supporting technology, and it has been used by over 6 000 young people in Kibera, Kawangware, and other slums in Nairobi. Youth interested in further advancing their ICT skills, as well as their communication, business and entrepreneurial skills, can also pursue training opportunities at the Craft Silicon Foundation Center at Westlands in Nairobi, Kenya.[1]

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[1]   http://digitalinclusionnewslog.itu.int/2016/08/30/craft-silicon-foundations-mobile-lab-teaches-digital-skills-to-youth-in-kenya/

Source: Daily Nation, https://www.nation.co.ke/lifestyle/DN2/School-on-wheels-takes-technology-to-nairobi-kenya-slums/957860-3353098-4a68i2z/

Non-formal education: public libraries, community centres and other lifelong learning channels

Given the rapidity of technology change, non-formal education is a critical part of national strategies because it creates opportunities for learners of any age to acquire new skills throughout their lives. Non-formal education can be offered at a variety of locations, including public libraries, community technology centres, NGOs, after-school programmes and tech clubs, as well as other community spaces, including as part of national, regional or international campaigns as described below. This nimbleness, along with the diversity of non-formal models, allows for greater innovation and currency compared with formal educational systems and can be well-suited for testing and introducing dynamic learning models.

Public libraries are central channels for learning digital skills in many countries. There are over 300,000 public libraries globally, with 70% of these in the developing world.[32] In countries that have invested in public libraries, they offer many advantages: community presence, physical infrastructure, qualified information professionals, and a sustainable public funding model.

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[32]   Beyond Access http://beyondaccess.net/about/. For map showing the numbers of public libraries in each country, visit http://beyondaccess.net/resources/map-public-libraries-around-the-world/

In **Sri Lanka**, the e-Library Nenasala Programme provides visitors to public libraries and houses of worship with digital skill instruction and access to a large selection of locally relevant materials. The 300 centres operate throughout the country and are open to everyone, but have been particularly important for people living in the lower-resourced areas of the country that generally lack the infrastructure to provide robust connectivity.[1]

Source : http://www.nenasala.lk/index.php?option=com_content&view=article&id=95&Itemid=516&lang=en

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[1]   http://www.gatesfoundation.org/What-We-Do/Global-Development/Global-Libraries/Access-to-Learning-Award-ATLA

The City of **Johannesburg** is working with Microsoft South Africa to teach one million residents the basics of digital literacy through the city's public libraries.[1] The free digital literacy training was forged under the city's Vulindlel'e Jozi Youth Program, which aims to skill-up disadvantaged youth so that they can enter the workforce.[2]

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[1]   http://www.itnewsafrica.com/2016/07/city-of-johannesburg-microsoft-partner-to-train-1-million-residents/
[2]   https://vulindlelejozi.co.za/

Community technology centres also play a strong role in many national digital inclusion initiatives, particularly in rural areas. Like libraries, community technology centres typically have a public mission and are supported in whole or in part with public resources. As such, they can provide free or reduced cost access to computers and training courses.
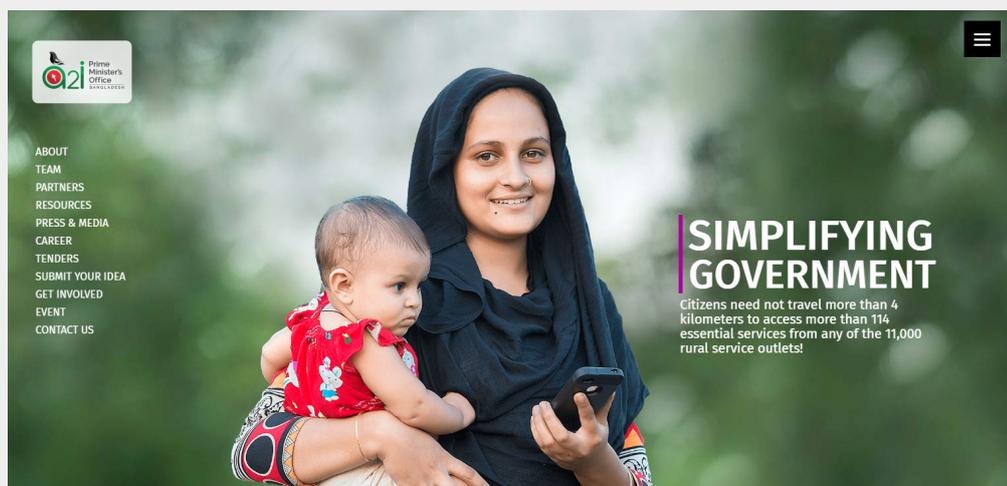
Bangladesh's Access to Information programme, with over 5000 digital centres in rural and remote regions, connects five to six million visitors each month. The centres offer a Digital Skills for Entrepreneurs programme, which has trained 3000 women entrepreneurs on business skills, digital skills, and hardware repair skills so that they can open their own IT repair centres, a much needed service in many rural areas.[1]

Source: http://a2i.pmo.gov.bd/

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[1]   http://digitalinclusionnewslog.itu.int/2017/03/13/it-training-for-women-entrepreneurs-in-bangladesh/

RLabs, established in Cape Town, South Africa and now with community centres in 23 countries, has a mission to "reconstruct communities through innovation, technology, and education." Digital skills are embedded in many of its classes on business development, employment development, and women's advancement.[1]

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[1]   https://rlabs.org/

NGOs and clubs offer numerous opportunities for non-formal learning, often targeted at providing services to job-seekers, marginalized groups, out-of-school youth, seniors, or self-organizing groups of people who meet to develop their skills together.

We care about **POVERTY**	We care about **DIGITAL INCLUSION**	We care about **HEALTH AND WELLBEING**
We care about **LONELINESS AND ISOLATION**	We care about **EMPLOYMENT**	We care about **SMALL BUSINESSES AND CHARITIES**
We care about **FINANCIAL INCLUSION**		

How we can help you... Work in partnership to achieve a greater impact

We care about **COMMUNITY COHESION**
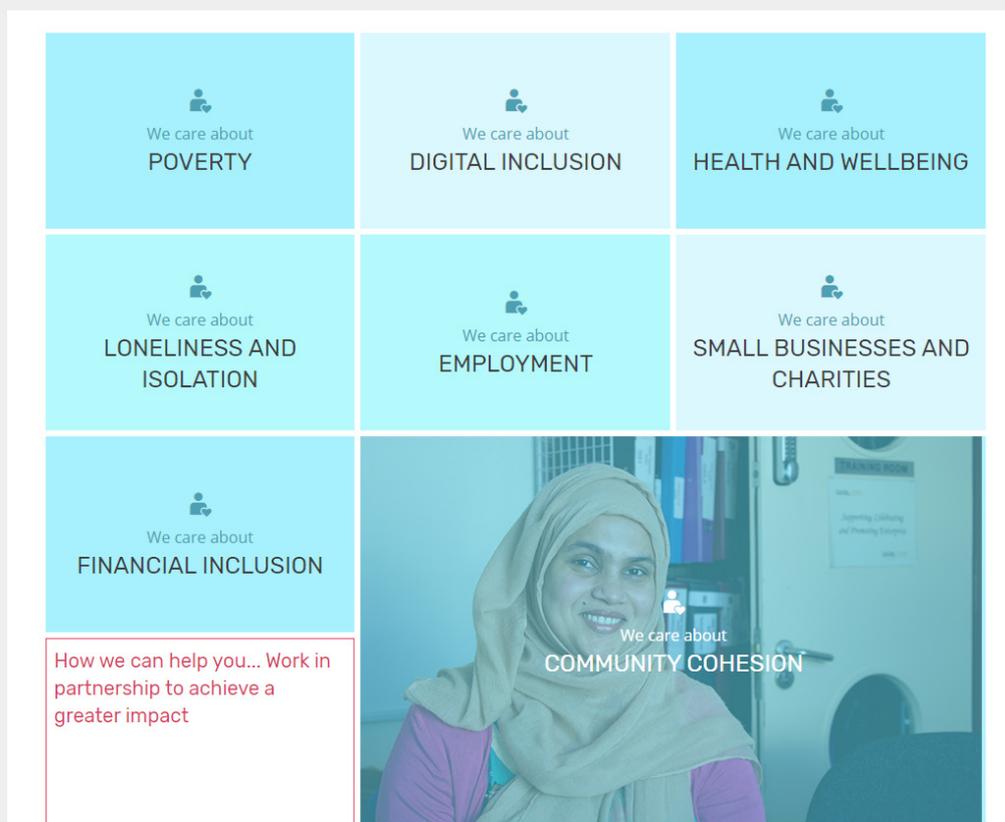
The Good Things Foundation (formerly Tinder Foundation) has helped over 2 million people in the UK to develop their digital skills. With support from the Department of Education, the foundation coordinates an expansive network of over 5000 community partners in the UK, including community centres, churches, housing associations, and public libraries among others, that provide free or discounted internet access and training to the public.[1] Learners who visit these centres, or who can access the internet at home, make use of the free Learn My Way curriculum, which covers basic computer skills such as filling out forms online, using online banking, and looking for a job online.[2] The Good Things Foundation has expanded to other countries and partnered with Google to support digital skills for small business owners and entrepreneurs.[3]

Source : https://www.goodthingsfoundation.org/#whatwecareabout

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[1] https://www.goodthingsfoundation.org/projects/future-digital-inclusion
[2] https://www.goodthingsfoundation.org/projects/learn-my-way
[3] https://www.goodthingsfoundation.org/projects/digital-garage

Makerspaces are another important dimension in the digital skills landscape. A makerspace is a collaborative space where people can explore their interests, create things, and 'tinker' using tools and materials. Makerspaces provide the resources and guidance for people to gain hands-on experience in areas like electronics, robotics, coding, and 3D modelling, or even just prototyping with cardboard and art supplies. Many makerspaces are located in schools, libraries, or other facilities. When a permanent facility is not feasible, many communities have organized temporary maker events called Maker Faires.[33] Maker Faire Africa took this concept to a continental level, hosting annual Maker Faire events

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[33] https://makerfaire.com/global/

from 2009 to 2015 in a different country each year.[34] These events served to stimulate bottom-up innovations to local challenges and foster an African community of makers.

Mozilla clubs are self-organized, peer-to-peer learning groups that have been launched in over 25 countries.[1] In 2016, Mozilla joined with UN Women to pilot a version of Mozilla clubs designed for women and girls in Nairobi and Cape Town. Participants learn Mozilla's web literacy curriculum, which includes topics on web navigation, content creation, coding, online rights, privacy, and security. A new curriculum on issues specific to women and girls is now available. Mozilla will also train leaders to facilitate work sessions in the clubs and will help connect participants to other opportunities linked to women's leadership, civic participation and economic empowerment.[2]

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[1] https://learning.mozilla.org/en-US/clubs/about
[2] https://learning.mozilla.org/blog/new-partnership-with-un-women-to-teach-key-digital-skills-to-women

Source: Maker Faire Africa[1]

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[1] http://makerfaireafrica.com/about/event-archive/maker-faire-africa-2010/

Makerspaces have also been known to support entrepreneurship and promote business start-ups. They also help young people to gain problem-solving skills and motivate them to pursue STEM careers.[35] Makerspaces can also be integrated into job-related digital skills training programmes or primary and secondary schools to provide opportunities for learners to experiment and further develop the new skills they acquire.

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[34] http://makerfaireafrica.com/
[35] https://www.makerspaces.com/what-is-a-makerspace/

In **Malaysia**, as part of the mydigitalmaker initiative which includes integrating STEM education into the national school curriculum, 60 organizations across the public sector, private sector, NGOs, and academia have joined efforts to create a maker ecosystem for youth. The ecosystem includes schools, where co-curricular digital technology clubs are supporting digital skills development, helping youth create digital inventions, and encouraging submissions to competitions. The ecosystem also includes universities and businesses, which are establishing Digital Maker Hubs, physical spaces equipped with digital making tools and learning resources, that will "augment the new national curriculum and bring local community members — students, educators, parents and industry experts — together to play, learn and create digital artefacts and innovations."

Source : https://www.mydigitalmaker.com/

Tool: basic and intermediate digital skills

The purpose of this tool is to identify and assess: (1) existing and potential channels, such as schools, public libraries, tech hubs and NGOs, where digital skills instruction can be delivered, and (2) existing digital skills programmes.

Channels

The first exercise is to review existing institutions in the country. The aim here is to assess the viability of these channels, to include both channels that currently offer digital skills programmes as well as those that have the potential for doing so. To identify and assess channels, complete the table below.

Once complete, consider how each channel could support a national digital skills strategy.

- Which challenges does each channel address (see list above)?

- What assets would each channel offer?

- Which channels offer the most promise for delivering digital skills training at scale?

- Which successful approaches would be helpful for a channel to be more effective?

- What other support or resources would a channel need to be effective?

- Taken together, would these channels provide the national coverage needed to ensure everyone had the opportunity to develop basic digital skills? If not, what regions or populations would be excluded, and how could you reach them?

Channel	Number	Distribution	Infrastructure	Instructors
	How many venues exist in the country?	What is the geographical distribution? (e.g. urban/rural)	What is the state of connectivity, computing equipment?	What are the qualifications/skills of instructors? This covers skills, knowledge and attitudes
Formal education				
Primary schools				
Secondary schools				
Non-formal education				
Public libraries				
Community technology centres				
NGOs and clubs				
Religious venues				
Other_____				

Existing digital skills programmes

Next, take stock of existing digital skills programmes offered through these channels. List the

programmes and describe their characteristics using the table below. Include subnational and small-scale training and educational programmes to ensure less-known successes are captured that could be scaled to the national level.

After completing the table, consider how each programme could better support a national digital skills strategy.

- Which programmes teach a combination of hard and soft skills that can be readily applied in the real world?

- Which programmes work most successfully with marginalized groups?

- Which programmes have the most diverse, supportive, or influential partners?

- How do these programmes report their successes and challenges? What outputs and outcomes do they measure?

- Which programmes produce the best outcomes for learners? What factors explain their impressive results (see Chapter 9 for assessment examples)?

Programme name	Population group	Skills taught	Evidence	Partners
Include both formal education and non-formal education programmes?	Who does this programme serve?	What skills are covered in the curriculum?	What outcomes has this programme produced?	Which partner organizations support this programme?

Programme name	Population group	Skills taught	Evidence	Partners
Include both formal education and non-formal education programmes?	Who does this programme serve?	What skills are covered in the curriculum?	What outcomes has this programme produced?	Which partner organizations support this programme?

Chapter 6: Advanced skills: supporting initiatives for people to gain specialized skills

In addition to ensuring adequate opportunities for everyone to develop basic digital skills, national skills strategies must secure their position in the digital economy by providing pathways for some to develop more advanced and specialized digital skills. The government can play a key role in cultivating talent to fill emerging jobs in the burgeoning tech industry, and in doing so spur future industry growth and job creation. Reskilling and retraining individuals is a critical piece of this endeavour, to ensure the existing workforce remains abreast of technological changes and does not fall behind with an obsolete skill-set. As with Chapter 5, this chapter covers common challenges, successful approaches, and a range of channels and examples for providing advanced digital skills training. It also includes a tool to identify and assess providers and programmes that deliver advanced digital skills training.

Learners seeking advanced and specialized technical skills training have traditionally turned to higher education, technical and vocational schools, and employers with apprenticeship programs. But increasingly, newer models like coding bootcamps and other commercial training programs, as well as makerspaces, have become popular channels for building technical expertise more closely aligned with the needs of industry – and in less time.

Common challenges

- *Affordability of training.* The coursework required to obtain advanced diplomas and specialization certificates is typically expensive and time-consuming.

- *Relevant curriculum.* Higher education and vocational programs struggle to keep up with the pace of technological change common in industry. Digital skills curricula must be forward-facing and revised often so that students can find work and build their careers. Moreover, higher education and vocational programs typically do not teach problem-solving or collaborative team-based approaches.

- *Sustainability.* Specialized and advanced skills programs are often faced with higher costs arising from expert trainers, up-to-date equipment, software licenses, and administrative costs. Additionally, it can be difficult for countries to retain talent and sustain a critical mass of skilled professionals who can then start businesses and spur innovation. Moreover, new models of rapid skills training are generally taught to small cohorts, limiting their ability to scale.

- *Adapting and innovating.* The needs of industry evolve rapidly as new technologies come to the fore, new businesses emerge, and entrepreneurs start new ventures. This dynamic environment requires stakeholders to respond proactively – with new partnerships, programs, and initiatives that involve innovative approaches for linking learning and workforce opportunities. An enabling business environment is necessary to promote digital transformation, digital entrepreneurship, and other opportunities arising from new digital technologies.

Successful approaches

- *Introduce sustainability models that lower upfront costs for learners.* Instead of relying on student fees up front, explore other models to keep the costs of advanced training more manageable for learners. For instance, some coding bootcamps have students pay for their program only after they have found work, while some employers motivate and upskill their staff by reimbursing them for the costs of completed coursework.

- *Build teams and task-forces.* Multi-sector partnerships enhance any digital skills program, but are especially critical to advanced skills training efforts. Taskforces comprised of IT industries, schools, places of higher education, public sector agencies, and community organizations can

be an important bridge – between the supply of talent with the right skills and the demands of specialized technical skills – by meeting frequently to update curricula, tailor programs, and connect learners with industry mentors and on-the-job opportunities. Non-formal training providers, such as coding bootcamps, can teach universities how they teach problem-solving and creative, collaborative approaches to learning, also achieving scale by integrating rapid learning methodologies in formal education.[36]

- *Incentivize participation from the private sector*. Tech companies, internet service providers, and other private sector organizations can be incentivized – for example, through tax incentives and public policies – to participate in the development and implementation of digital skills training. Public policies can be extended as appropriate to provide incentives to federations and associations of IT companies where they exist. Incentives may also apply to small businesses and start-ups, in ways that allow new IT specialists to gain traction as entrepreneurs and even find synergies with other start-ups, as has been the case with tech hubs. And specifically, at the international level, because certifications in advanced digital skills can be too expensive for talented young people with no resources, tech companies could offer discounts and vouchers that align with the goals of larger campaigns, such as the "Decent Jobs for Youth" global initiative.

- *Ensure pathways from training and education programs to the workforce*. Providers of advanced ICT training should offer job-placement services to help their graduates enter the job market (and demonstrate the effectiveness of their programs). If such services are not an option, programs can still help students market themselves to employers by having them build a portfolio of their digital skills and enhance their presentation skills, or teach the business and entrepreneurship skills needed for graduates to create their own paths. Pathways for students can be paved by membership in professional associations and networks. The need for such pathways is especially needed for youth and young adults as they finish upper secondary school, complete undergraduate courses, or graduate from university – and needed too for older adults shifting careers.

- *Review accreditation requirements*. Given the emergence of new training providers, new skills specializations, instructional methods that are new, dynamic and peer-driven, as well as new online platforms, standard approaches for accreditation may need to be reassessed. They need to be vigilant enough to monitor quality across disparate providers while remaining adaptable enough to make space for innovative approaches to credentialing. This may involve increased recognition of credentials obtained in other countries or allowing credits earned in non-formal education (e.g. digital badges and online course completion certificates) to count toward credit in formal education institutions.

Training providers

Training providers include: employers, technical and vocational schools, bootcamps and other commercial training programs, and makerspaces.

Employers and workers' organizations

Employers have always played a critical role in training the workforce through direct hiring, on-the-job training[37], and apprenticeship programs. However, given the shifting nature of the global economy, many companies have come to rely on employees that have obtained skills through other means, often a combination of higher education and internships. This is particularly true in the digital economy, where specialist jobs require an extensive base of knowledge and technical skill – the hiring pool

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[36] ITU has developed a training programme for potential coding bootcamp operators and trainers that can support such efforts. https://www.itu.int/en/ITU-D/Digital-Inclusion/Youth-and-Children/Pages/Coding-bootcamps-training.aspx

[37] One example is Unilever and its "Learning Hub," the company's "collaborative digital learning platform" that enables employees to learn new skills. https://www.unilever.com/sustainable-living/our-strategy/embedding-sustainability/developing-and-engaging-our-people/

now extends far beyond national boundaries. Fortunately, many employers are taking a pro-active role in joining forces with public entities and NGOs to support a pipeline of local people gaining more advanced skills through job-training and reskilling programs.

Capacitate Para el Empleo (Training for Employment) is an online platform that offers free skills training courses, including training on ICT skills identified by employers in the Latin American communities where they operate. The platform's content is developed in collaboration with leading employers to ensure the relevance of training and certification. Programme organizers then work with these employers to place trainees into the local workforce through apprenticeships or full-time employment. The platform, which is supported by the Carlos Slim Foundation, is regularly updated to reflect best practices in online training.[1] To date, over four million students have registered for 186 online courses.[2]

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[1]   Broadband Commission, page 45
[2]   http://fundacioncarlosslim.org/empleo/

Trade unions and workers' rights organizations have the potential to support digital skills development in several ways. These include: extending digital skills training opportunities to their membership; advising outside training programs on the type of digital skills and technologies needed to advance conditions and opportunities for their membership; and providing opportunities for members (past or present) who have advanced their skills to teach other members and support the development of better labour practices.

Over a three-year period (2017-2020), the Vietnam Farmer's Union (VNFU) plans to train 30,000 farmers on how to find information on the internet, use basic productivity tools, and make use of agricultural apps.[1] The effort, funded by Google.org with technical expertise from Google volunteers, aims to help "farmers across Vietnam [boost their] productivity and their overall quality of life." The program's audience extends to the children and grand-children of farmers:

"During [the pilot trainings, we] learned that many farmers already have internet access at home, or even their own smart devices, but they don't necessarily know how to use them to their full potential. So we expanded the training to include the farmers' children or grandchildren. Through this "buddy" system, pairing farmer and child, the farmers have someone at home to help them, and in this way, we hope the training program will have longer-lasting and more wide-ranging impact."

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[1]   https://blog.google/topics/google-asia/bringing-digital-skills-training-30000-farmers-vietnam/

Technical and vocational schools

In many countries, technical and vocational education and training (TVET) schools, colleges and universities have played an important role in workforce development for decades. These schools provide training in a wide variety of occupational fields, and adults of all ages can gain job-ready skills, whether reskilling or entering the workforce for the first time. The provision of ICT-specialist training has been and remains a growing area. TVET programs are often government funded, but may be provided by both private sector and civil society as well. However, TVET schools can have trouble placing graduates

given the constantly changing needs of employers and the wider digital economy. The programs could benefit from working closely with industry to keep up with industry developments, from incorporating innovations from other types of training providers (like coding bootcamps) and from obtaining resources and programmatic flexibility to launch new types of programmes as needs shift.

With **Argentina** Plan 111, the country aims to train 100,000 programmers, 10,000 professionals, and 1,000 entrepreneurs over four years. Participants will learn how to develop software for a variety of uses while gaining complementary skills needed to work in industry. The program consists of a two-semester course taught in technical schools, vocational training centres and universities and leads to a certificate with national validity and endorsed by the Ministry of Education and the Ministry of Production of the Nation.[1]

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[1]   https://www.argentina.gob.ar/111mil

Coding bootcamps

Source: Coder Academy Australia

A popular channel for private sector investment and leadership is instruction through coding bootcamps and coding schools. Coding bootcamps are intensive, in-person courses where students with no coding experience can learn the skills needed to get a job in just a few months. Often such bootcamps have rigorous screening processes and are selective about the students they accept. Bootcamps teach web development, mobile application development, user experience design, data science, and other specializations. Some also provide employment services to help students transition into the workforce. Coding bootcamps are flourishing in many countries, since they help address digital skills shortages in the workforce while providing new job opportunities for people looking to enter the workforce or change careers. At the same time, coding bootcamps are a relatively recent phenomenon so it is too

soon to know how successful this strategy will be. The ITU has produced a thorough report on coding bootcamps that contains useful information for any country considering this approach.[38]

One coding bootcamp that has left a mark on its students and on the region is the Moringa School in **Nairobi**, which has been providing training since January 2015. Students may complete one of two tracks: full-stack development, which features training in Ruby, JavaScript, and the Rails framework, or mobile development with training on Java, JavaScript, and the Android framework. The 21-week core program boasts a 99% job placement rate, with most graduates reporting a significant income increase. The school also offers a two-day introductory program called Junior Moringa School that covers the basics of coding.[1]

[1] http://www.moringaschool.com/

Most coding bootcamps exist as commercial organizations, but social enterprises and non-profit organizations run such courses too. Many of these have financial support from private sector or international development bank sponsors.[39]

Source: Academia de Código

[38] https://www.itu.int/en/ITU-D/Digital-Inclusion/Youth-and-Children/Pages/Coding-Boot-camps.aspx
[39] http://www.itu.int/en/ITU-D/Digital-Inclusion/Youth-and-Children/Documents/CodingBoot-camps_E.pdf

Laboratoria is a non-profit organisation that provides young low-income women in **Peru, Mexico, and Chile**, the opportunity to attend coding bootcamp. The programme offers six months of coding instruction plus an additional 18 months of continuing education. Laboratoria has partnered with women's organizations to provide web development training to their members, and has partnered with Codea Lab, a for-profit provider of coding bootcamps, to provide scholarships to women seeking more advanced training in coding.[1]

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[1]   http://www.itu.int/en/ITU-D/Digital-Inclusion/Youth-and-Children/Documents/CodingBoot-camps_E.pdf

Commercial training programs

Commercial training programmes provide a more diverse, more long-term range of courses on digital skills in addition to coding bootcamps. Such programmes teach a range of other in-demand advanced digital skills, such as those required for employment in areas like big data and IoT.

IT STEP Academy, started in 1999 in **Ukraine** and is now providing training programmes in 17 countries with 47 branches around the world. IT STEP Academy offers digital skills training courses for different age groups, ranging from young children to adults, in different advanced digital skills. These include computer graphics and design, networking and system administration, software development, mobile app development, internet marketing and game creation among others. The length of the training varies depending on age group and course specialization – ranging from one year to two-and-a-half years – featuring face-to-face sessions supported by online materials. Depending on the specialization, students might need some basic digital skills to enrol.[1]

Source: IT Step Academy

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[1]   More information available at https://itstep.org/en/about/

Tool: expanding tech specialists

This tool will help you identify and assess: (1) providers of advanced or specialized digital skills training, such as vocational schools and coding bootcamps, and (2) specific programs offered by these providers.

Providers

The first exercise is to review existing training providers in the country. The aim is to assess the potential for these providers to improve or expand on their digital skills programs to create more or

better opportunities for individuals in the country to become tech specialists. To do so, gather the data needed to complete the table below.

After completing the table, consider how each training provider could support a national digital skills strategy.

- How does each of the providers perform in regard to the common challenges listed at the beginning of the chapter? What assets does each channel offer?

- Which successful approaches would help a training provider be more effective?

- What other support or resources would a provider need to be effective?

- Taken together, do these training providers offer adequate opportunities for individuals to acquire advanced or specialized technical skills? If not, what would have to change for them to become more effective providers?

- Could these providers be tapped to train teachers or university professors to improve their skills provision?

Provider	Name	Distribution	Infrastructure	Instructors
	Who are the established digital skills training providers? Who are the new or emerging providers?	What is the geographical distribution? (e.g. urban/rural)	What is the state of connectivity, computing equipment?	What are the qualifications/skills of instructors? This covers skills, knowledge and attitudes
Employer-led training				
Technical and vocational training				
Coding bootcamps				
Other commercial training providers				
Trainers who support digital skills campaigns				
Makerspaces				
Other_____				

Existing advanced or specialized digital skills programs

Next, evaluate the quality of existing digital skills programmes offered by these training providers. List the programmes and describe their characteristics using the table below. Include subnational and small-scale training and educational programmes to ensure less-known successes are captured that could be scaled to the national level.

After completing the table, consider how each programme could better support a national digital skills strategy.

- Which programmes teach a combination of hard and soft skills that can be readily applied in the real world?

- Which programmes work most successfully with marginalized groups?

- Which programmes have the most diverse, supportive, or influential partners?

- How do these programmes report their successes and challenges? What outputs and outcomes do they measure?

- Which programmes produce the best outcomes for graduates and learners? What factors explain their strong results? (See Chapter 10 for assessment examples)

Program name	Population characteristics	Skills taught	Evidence	Partners
	Who does this pro-gramme serve?	What skills are covered in the curriculum?	What outcomes has this programme produced? What are the participation rates? What are the job placement rates? Impacts on the sector or types of innovations?	Which partner orga-nizations support this programme?

Chapter 7: Creating opportunities for under-represented populations

Many countries are taking steps to create more inclusive, equitable opportunities for populations that have been under-represented among internet users. These groups may have had fewer opportunities to use digital technologies and develop basic skills for any number of reasons, such as cost, age, social norms and expectations, physical ability, awareness, geography, level of education, or language spoken. Furthermore, those self-directed few who have acquired basic skills through an introductory computer course or online course may have encountered too many barriers to continue building on their knowledge and gain entry into the workforce. This chapter addresses these important issues, identifying common challenges, successful approaches, and several programme examples for the following groups: women and girls, persons with disabilities, aging populations, and migrants and refugees. This is followed by a tool for ensuring that a digital skills strategy meets the needs of priority population groups.

When countries prioritize inclusion, identify populations to target, and take the necessary actions to ensure truly equal opportunities to develop digital skills, it can help narrow socio-economic gaps and build more inclusive societies. If this is not done, existing digital divides can continue to widen, further exacerbating existing socio-economic inequities, such as lower incomes and higher unemployment for already marginalized groups.

While many challenges and solutions apply to a range of under-represented populations, some of the discussion below focuses on challenges and solutions for women and girls and persons with disabilities. Other targeted strategies may be necessary for other under-represented groups.

Common challenges

In addition to the challenges mentioned in earlier chapters, digital skills strategies for under-represented populations face unique challenges.

- *Lack of awareness and stereotypes.* Often, under-represented populations are unaware of the importance of digital skills development or the career opportunities that exist for people with advanced digital skills. Due to cultural stereotypes, women may not be encouraged by their parents, teachers and peers to develop their digital skills, and may even be discouraged from doing so. On occasion, where persons with disabilities face barriers to use, teachers, employers and persons with disabilities themselves may not be aware that accessible ICT solutions could facilitate their participation in digital life and work.

- *Affordability of training.* Training programmes that charge fees or are not centrally located are less likely to attract and retain participants from less represented populations.

- *Qualified instructors.* In addition to being skilled teachers and tech-savvy, teachers need to be knowledgeable about the population they are instructing and made aware of their conscious and unconscious biases. In particular, instructors require awareness training that equips them to make interventions that encourage women students who lack self-confidence – or those who may feel embarrassed or threatened by male students more used perhaps to dominate classroom dynamics. There is also a lack of instructors who really comprehend what is meant by accessible ICTs for persons with disabilities and who can coach their students in developing such solutions.

- *Infrastructure.* The physical space and equipment used for programmes need to be carefully selected or sensitively modified as appropriate for accessibility and for students' cultural needs. Challenges around connectivity and electricity will be greater in remote areas where many marginalized people reside. Women, when under-represented in classrooms, may feel reluctant for example to use computer labs populated only by men. ICTs and the physical environment must be accessible for persons with disabilities.

- *Relevant curriculum.* When working with marginalized populations, it is important to design digital skills programmes that meet the specific needs of specific groups. Training material must be assessed to ensure that it is culturally appropriate, teaches relevant skills and competencies and addresses barriers faced by the under-represented populations. Curricula on developing and using accessible ICTs required by persons with disabilities often need to be developed.

- *Adapting and innovating.* Innovative approaches must be taken to bridge the skill gap between marginalized groups and the larger population. Especially in countries where women have lower language literacy rates than men, bridging this gap will also include the need for complementary language literacy training to ensure women can use text-based digital content. Consideration can also be given to using video content for people who are not literate, such as YouTube "how to" videos. Accessibility solutions for persons who are blind (such as screen readers) can also greatly benefit users who lack literacy.

Successful approaches

In addition to successful approaches described in earlier chapters, the following strategies can help reach under-represented groups.

- *Raise awareness and address stereotypes.* With women and girls in mind, develop media and social media campaigns designed to raise awareness among under-represented populations, parents, teacher, employers and the general public. These would stress the importance of ensuring women and girls develop their digital skills, and would identify career opportunities that go with such skills. Such campaigns would combat stale stereotypes that only men have developed advanced digital skills. For persons with disabilities, identify accessible ICT solutions and provide training to persons with disabilities on how to use these solutions.

- *Conduct campaigns to provide digital skills to under-represented groups.* These campaigns can be home-grown or part of on-going international, regional or national campaigns. One example is ITU's International Girls in ICT Day campaign designed to attract more women and girls to ICT studies and careers. Campaigns should include outreach to decision makers such as teachers, parents and employers as well as to members of the identified population. Campaigns can include a target for the numbers of individuals to be trained.

- *Offer free or subsidized training to members of under-represented populations.* In setting targets for the numbers of individuals to be trained in a campaign, governments and the private sector can offer free or subsidized training for members of the under-represented population, including the provision of scholarships. Private sector stakeholders could advertise scholarships they have funded through corporate social responsibility programmes. Government could offer tax incentives for such scholarships. Alternatively, training costs can be subsidized and repaid when the trainee finds paid employment.

- *Motivate the private sector.* Motivate the private sector generally to support equality in digital skills development in order to achieve diversity targets and reap the various benefits of workforce diversity – such as apprenticeships, mentorships, fundraising, and job hiring. This can be undertaken in parallel with prioritizing public investment in programmes for under-represented groups and encouraging the private sector to fund scholarships.

- *Develop an outreach strategy.* Gain trust and buy-in from communities that are often excluded from the digital economy. Speak with leaders in the community and raise awareness through trusted channels – such efforts will greatly help in creating awareness for your programme.

- *Involve the target population.* Consult with those in your target community during programme design, and design opportunities for involving them in a variety of roles throughout programme implementation. For example, those who receive training can later become instructors or advisory board members, providing ongoing feedback on programme improvement.

- *Bring in instructors with a shared background.* Instructors that live locally or share the background of your target population can be a great asset – and are particularly valuable when working with under-represented populations. Such instructors have been associated with better learning outcomes for students, and on occasion are essential - for example in cultures where women can only receive instruction from other women. Instructors from the cultural or geographic community will also add value as role models, advocates, and cultural or local experts. Recruiting these instructors may require upskilling, as outlined in Chapter 5.

- *Adapt curriculum and training methods:* Analyse what changes to curriculum and teaching methods are needed to make them more attractive and accessible to members of under-represented populations. For women and girls, curricula can be adapted to be more appealing and less intimidating to those who may have no prior background in coding – for example beginning courses by looking at more intuitive coding languages and integrating exercises that demonstrate how creative coding can develop solutions to challenges that women may face[40]. Other measures may include integrating team projects into the curriculum, ensuring students with previous advanced digital skills experience do not dominate classroom discussion and ensuring that students with limited previous experience are supported in their learning. Adaptation also requires gender bias training for teachers, to maximize encouragement for girls to pursue science and technology interests. For persons with disabilities, there is a need for training programmes on creating accessible ICTs, such as accessible websites, mobile apps and devices. Similar approaches are needed for other groups, such as the elderly and indigenous populations among others.

- *Leverage mobiles*. In some regions, mobile phone ownership is widespread among marginalized populations, while access to other ICTs remains scarce. In such environments, training programmes can increase appeal and relevance by incorporating smartphones into their instructional methods and curricula. Examples of what a mobile literacy curriculum could look like is included in Chapter 2.

- *Create thoughtfully designed spaces*. Design physical spaces to be inclusive and welcoming. Features of good design include: accessibility that respects the specific needs of participants; ability to reconfigure the space for different uses; the provision of natural meeting spots such as a kitchen to facilitate unprompted interaction, serendipitous discovery and playful creativity.[41]

- *Measure progress.* In most countries, limited data is collected to measure digital skills in the general population, and what data is collected is done so in a fashion that makes meaningful analysis impossible. Any national strategy committed to preparing under-represented groups for the digital economy must have access to data that can be disaggregated by age, gender, and disability, and other characteristics that define the country's target populations (e.g. language, socio-economic status). More information on data and assessments in included in Chapter 10.

Population groups

A country needs to identify which groups have been most excluded from its digital economy and make a targeted effort to erode barriers that exist, whether they be socio-economic, institutional, geographical or cultural. Digital skills training can bridge the needs of these groups with new opportunities in formal educational and employment. While acknowledging that target groups can intersect and overlay with other marginalized groups, this digital skills toolkit focuses on these groups that are commonly under-represented in the general ICT context – women and girls, persons with disabilities, migrants, and aging populations. Some countries will need to address other marginalized groups.

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[40] See, e.g. 2015 video statement of Dr. Maria Klawe, President Harvey Mudd College, made for ITU Geneva Girls in ICT Day event at https://www.youtube.com/watch?feature=player_embedded&v=ObDsNtb3mOk

[41] Coward, C., & Wijeweera, D. (2014). From access to information to access to each other: Why libraries should develop innovation spaces. In Buhle Mbambo-Thata, Jerry Raubenheimer, Terry Lynne Harris (Ed.), The Horizon and Beyond: African Library Summit 2013.

Women and girls

Women and girls are less likely to have access to ICTs than their male counterparts, and when they do have access, they use the internet less often than men. Women are also grossly under-represented in ICT professions, a rapidly growing sector that is projected to provide many highly paid jobs and to face a shortfall of over 10 million skilled professionals globally. A reduced digital gender gap would also have significant economic implications in regard to women's influence on consumer purchasing[42] and via the impact of increased gender diversity on companies' profits.[43]

Girls programming robots at ITU Girls in ICT Day Geneva event
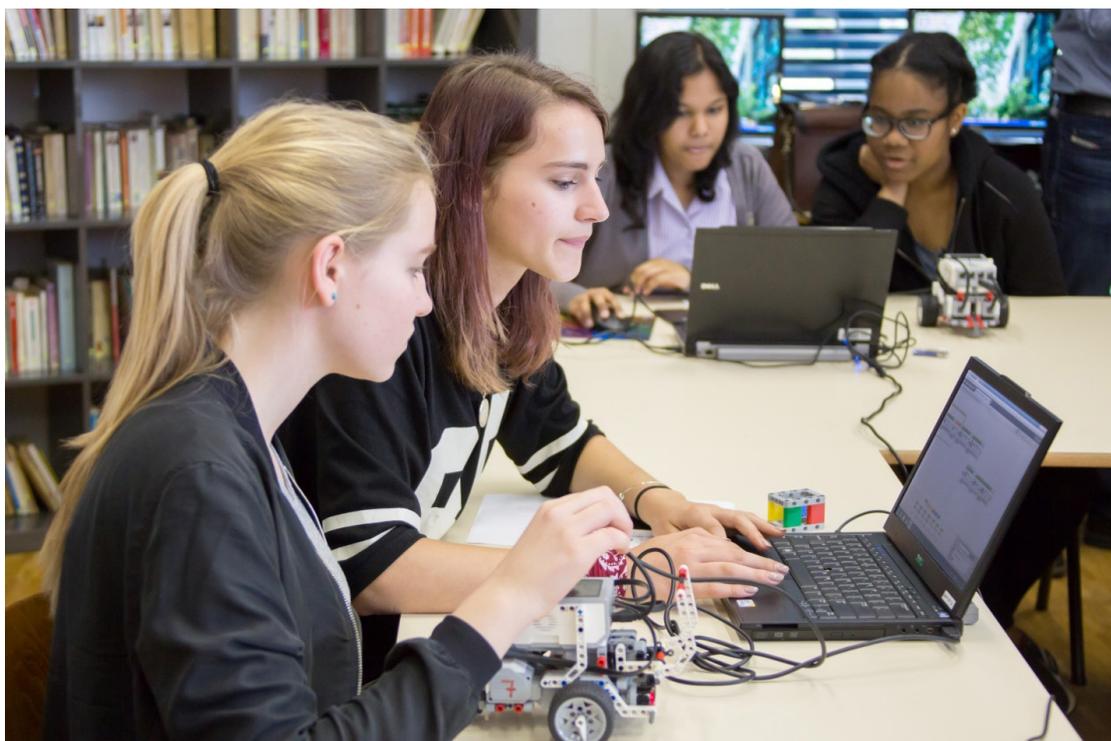
Source: ITU

Encouragingly, many national digital skills plans recognize this reality, and worldwide, dozens of organizations are advancing digital skills learning for girls and women.[44] However, stronger commitment from both public and private sectors is required for women to truly reap the benefits from equal participation in the digital revolution.

International Girls in ICT Day is an effort led by ITU to draw international attention to the need to promote technology career opportunities for girls and women. Since 2011, over 300,000 girls and young women have participated in over 9,000 celebrations of International Girls in ICT Day in 166 countries."[1]

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[1] www.itu.int/girlsinict

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[42] http://www.forbes.com/sites/bridgetbrennan/2015/01/21/top-10-things-everyone-should-know-about-women-consumers/#1653930f2897
[43] https://www.weforum.org/agenda/2016/01/why-gender-equality-makes-business-sense/
[44] http://www.itu.int/en/ITU-D/Digital-Inclusion/Women-and-Girls/Girls-in-ICT-Portal/Pages/Links-to-related-organizations.aspx

International Girls in ICT Day organizers introduce participating girls and young women to advanced digital skills training such as mobile app and website development, coding, computer repair, and robotics and provide them with pitching and mentoring opportunities in an effort to inspire them to take up ICT studies and careers.[1]
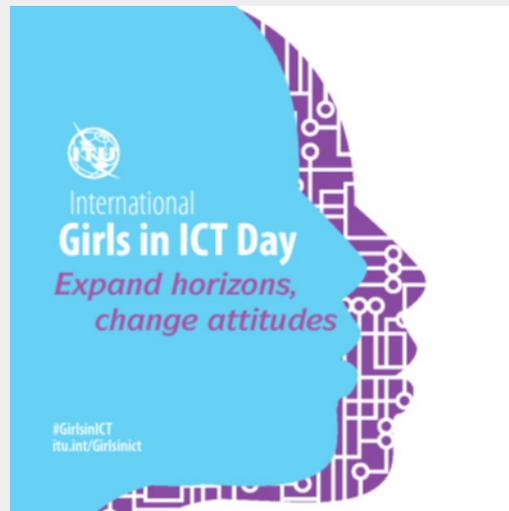
In **Tanzania**, as part of the Girls in ICT Day initiative, young girls are building their technical and entrepreneurial skills by learning to develop and pitch mobile apps. Girls with high marks in science and mathematics examinations are invited to participate in a three-day training event, held in six locations across the country. Participants learn the creative process for generating ideas, identify a challenge in Tanzania that could be addressed through a mobile app, learn to develop a mobile app using MIT App Inventor, and then pitch their app to their peers. A national training session is held for the top-performing groups in each region. Since 2016, 428 girls and 32 teachers across the country have participated in the programme led by the Universal Communication Service Access Fund (UCSAF) and She Codes for Change, an organization that works to encourage girls to enter STEM and ICT fields in Tanzania.[2]

Source: UCSAF Tanzania

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[1] http://www.itu.int/net/pressoffice/press_releases/2016/15.aspx#.WMV7PBIrKHp
[2] Broadband Commission, page 18

In 2013, the She Will Connect initiative was launched by Intel and NGO partners in **Nigeria, Kenya, and South Africa** to help women acquire digital skills and increase their awareness of the benefits of connectivity and technology while promoting social and economic empowerment of women. The programme includes digital literacy skills training, access to a peer network and gender relevant content, as well as pathways to income generation opportunities.[1]

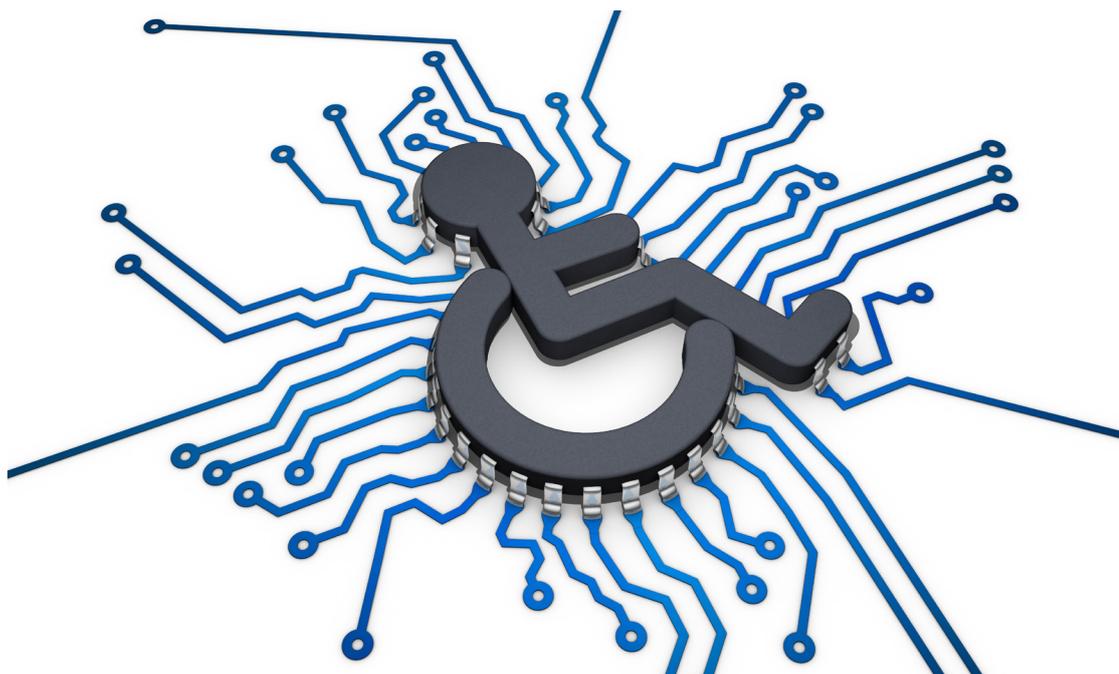[1]   Broadband Commission report (p71)

Argentina Plan 111 Video: Chicas programadoras, shattering stereotypes by asking how different people imagine a coder and then introducing successful women coders.

https://www.youtube.com/watch?v=yUznq2SHKMs

Persons with disabilities

Accessible technologies and skill development programmes can enable persons with disabilities to become entrepreneurs, gain employment in conventional job sectors, and find work in the burgeoning tech sector. Unfortunately, people with sensory and physical disabilities are too often excluded from digital technologies and the opportunities they afford.

Source: Shutterstock https://www.shutterstock.com/it/image-illustration/cpu-wheelchair-180349412?src=
BgfdOedei3jQBXmjP8UV9Q-1-54

While some progress has been made to remove barriers to the use of digital technologies for persons with disabilities, particularly through the development of accessible hardware and software, there is still need for innovative solutions to support persons with disabilities in their lives. There is a need for university computer science courses and other ICT design and development courses to teach students how to develop accessible ICTs. Fortunately, universities have begun providing accessible ICT development courses, and there is at least one open online computer science university course that teaches these skills.

Some universities are also offering courses that provide training in web content and design accessibility. The web accessibility training programme developed by ITU provides for the training of university professors so that they can continue to train more web accessibility experts in their country in the future.

To promote web accessibility for persons with disabilities, ITU in 2017, has developed a national training programme, Internet for @ll, composed of two train-the-trainer courses on creating accessible web content and the design and development of accessible websites in line with the WCAG 2.0 web accessibility standards.[1] Both courses include accessibility validation conducted by persons with disabilities. The national training programme on web accessibility also includes a decision maker's buy-in session, to raise awareness among policymakers and regulators for the need for web accessibility policies, and also presents a self-sustainable model, based on national certification for the two trainings, designed to generate funds for capacity building of persons with disabilities on how to use accessible websites. The web accessibility programme was first delivered in Costa Rica.

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[1]   https://www.itu.int/en/ITU-D/Digital-Inclusion/Persons-with-Disabilities/Pages/Internet-for-%40ll.aspx

Open online course on ICT accessibility design from Georgia Tech Professional Education[1]

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1   https://pe.gatech.edu/courses/information-and-communication-technology-ict-accessibility

Even with the expanding array of accessible and assistive technologies developed for persons with disabilities, there remains a massive gap between the existence of those technologies and their availability and affordability. ITU promotes ICT accessibility policies to promote the widespread availability of accessible ICTs[45]. In addition some NGOs are working to narrow the assistive technology gap.

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45   ITU Model ICT Accessibility Policy report. https://www.itu.int/en/ITU-D/Digital-Inclusion/Pages/Reports.aspx

A report from Leonard Cheshire Disability, **a UK-based charity** providing a range of services to persons with disabilities, cites a 2015 report from the UK Office for National Statistics: nearly 1 in 3 disabled adults (27%) have never used the internet.[1]

The organization's Discover IT programme provides access to computers, assistive technologies, and other specialist adaptations via 19 accessible IT centres, which are run either by Leonard Cheshire Disability or in partnership with other organizations. Clients undergo assessments and then receive training and support to use the most appropriate hardware and software for their needs. Clients can also use online learning resources for literacy, numeracy and employability skills. A sister programme, Discover IT@Home, brings digital technologies and support to clients' homes. Over 7,600 individuals participated in the programmes between 2010 and 2015. Feedback from their clients has been positive[2]:

> "I am now able to access the computer with our eye gaze system. I am only able to move my head so this gives me the ability to make choices. I feel more confident about the future and being able to communicate my needs."

> "I didn't realise as a disabled person how important having a computer and internet could be – now I do... It's liberated me."

[1]   Leonard Cheshire Disability (n.d.). "Developing life and work skills: the impact of our programmes," pp 21-25. Available at: https://www.leonardcheshire.org/sites/default/files/developing_life_and_work_skills_-_the_impact_of_our_programmes.pdf

[2]   Leonard Cheshire Disability (n.d.). "Developing life and work skills: the impact of our programmes," pp 21-25. Available at: https://www.leonardcheshire.org/sites/default/files/developing_life_and_work_skills_-_the_impact_of_our_programmes.pdf

Persons with disabilities can benefit from greater access to training opportunities, whether the goals of the programmes are related to digital inclusion or employability. More advanced training can support their employment in fields like web design, content development, and checking websites for accessibility. Complementary instruction focused on soft-skill development and job placement has also proved to be beneficial.

In **Egypt,** the Ministry of Communications and Information Technology (MCIT) provides a lifelong learning programme to help persons with disabilities find work while also offering training on basic digital skills, soft skills, and more advanced skills as requested from IT companies with an interest in hiring.[1] The programme was formed with support from the community of persons with disabilities, NGOs, and the Chamber of Commerce, and is part of a larger MCIT initiative that has provided training to 600 youth with disabilities in a wide range of areas to help them transition to the IT workforce: the basics of computers, laptops and mobile phones; the basics of design and graphics; customer service; management and entrepreneurship skills; presentation skills; leadership and communication skills; and marketing and e-marketing skills."[2]

[1]   http://www.itu.int/net4/wsis/stocktakingp/en/Database/Search?pId=1449316637
[2]   http://www.mcit.gov.eg/Media_Center/Latest_News/News/4371

Aging populations

Many seniors around the world missed the digital revolution and now lack the basic digital skills that others acquired in school or the workforce. Even those who own a computer or mobile phone may be uncomfortable using it. Seniors benefit greatly when they can develop the type of interactive digital skills that allows them to keep in touch with friends and family, access social services, and search for information.

Source: Shutterstock https://www.shutterstock.com/image-photo/senior-adult-computer-social-networking-connection-428914999

In 2016, in the city of Armenia (**Columbia**), 2,275 residents over the age of 54 participated in the "AdulTICoProgram." The programme offered interactive, seminar-style, hands-on workshops to teach seniors basic computer skills, how to use social networks, and the wide range of ways the internet could be of value to them. The programme was found to build the independence, autonomy, perspectives, and knowledge of participants.[1]

[1]   https://en.unesco.org/news/reducing-digital-gap-senior-citizens-colombia

Migrants and refugees

Migrants and refugees benefit when they are capable of using digital technologies, whether accessing news about their home communities, using social media to stay close to loved ones, finding information to help them navigate a new way of life, or for the purpose of entertainment, playing games, or producing creative work, like poetry or music, to process and transform traumatic experiences. Digital technologies can be used to combat disruption caused by displacement in areas such as schooling for young people or work-place skills for adults.

Migrants and refugees may have very different levels of exposure to and comfort with using ICTs. For instance, a 2015 survey conducted at a refugee camp in Jordan found that five of every six young

people owned a mobile phone, and that the majority of mobile phones in the camp were smart-phones.[46]

The "Algarrobo Abuelo" campaign, a digital inclusion initiative of the government of San Luis province in **Argentina**, connects aging populations to the internet. Seniors in the province receive tablets preloaded with applications and services designed for them, including "different applications to access newspapers, television, a list with their medications and alarms that remind them to take them, games and entertainment, alarms to call firefighters, the police or an ambulance, among others."[1] The province wants to ensure seniors maintain access to public services as they are digitized, including the ability to sign documents electronically.

[1]   http://agenciasanluis.com/notas/2016/09/30/algarrobo-abuelo-inclusion-digital-de-los-adultos-mayores/

The Pi4L pilot programme is a partnership between UNICEF and the International Education Association (IEA) that has helped Syrian refugee children in Lebanon build their computer literacy skills, increase their autonomy as learners, and ease their transition into mainstream schools via non-formal learning. [1]The programme began with intensive instructor training to train teachers on new digital skills and interactive learning approaches. It was followed by a six-week programme for children aged 8-15 to learn basic numeracy, computer coding, and personal/social skills through the use of technology: Raspberry Pi computers, Scratch coding software, and KA Lite (offline version of Kahn Academy[2]). The curriculum is based on UNICEF's 'LifeSkills' (social and health awareness) themes, and is implemented with the partnering with four delivery agencies (Ana Aqra, AVSI, Beyond, and Mouvement Social).

[1]   http://iea.org.lb/Sections.php?ID=4
[2]   https://learningequality.org/ka-lite/

Tool: including under-represented populations

The purpose of this tool is to develop ideas on how to make existing training programmes more inclusive of marginalized populations, as well as to prototype new programmes.

1.   To start, list and define the under-represented groups your national strategy aims to target.

2.   Create an opportunity triangle for each target population group using the example below. The sides of the triangle represent considerations for working with this group: Needs (what), Channels (where), and Programs (how).

3.   For each population group, work through the following steps:

   a.   List the needs, channels, and types of programmes most relevant to the target group.

   b.   Consider the following:

      i.   Reviewing the needs of the target population, what opportunities and limitations do these needs present? (For instance, if health needs are paramount, could trainings be provided in community clinics or at home for people who are less physically mobile
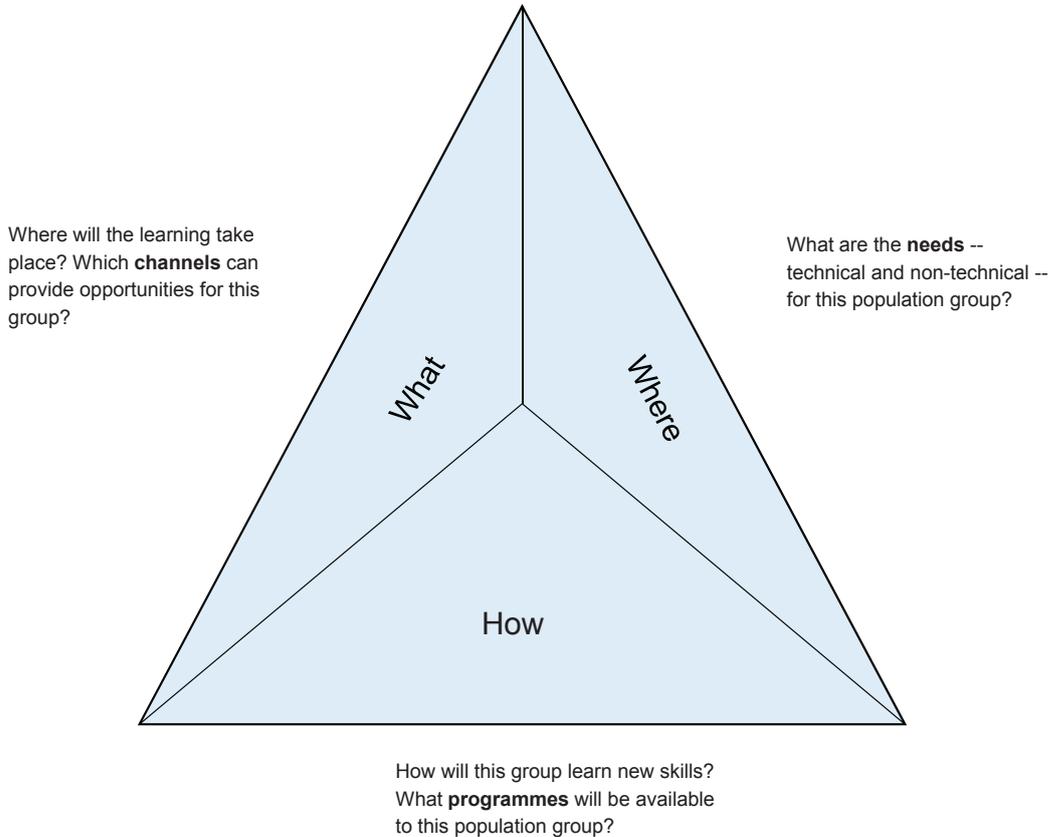
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[46]   Maitland and Xu 2015; Creative Associates International, 2016 via https://openknowledge.worldbank.org/bitstream/handle/10986/25172/Lessons0of0exp0d0guiding0principles.pdf?sequence=1&isAllowed=y

(where)? Could curricula include topics on how to find and evaluate health information (how)? If lack of use of digital technology or lack of representation in creating digital technology is most important, how can outreach to the groups be raised and attitudes of others be changed? What changes in curriculum or teaching methods are required?)

ii. What channels are currently most visited by the population group? Which channels could conceivably attract more people? Which ones are less welcoming to this group, and what changes would be needed to make them more welcoming? What new channels are required?

iii. To what extent do existing digital skills programmes respond to the needs and spaces discussed? What changes to the programmes are required?

b. Reflecting on the answers above, create a prototype of a digital skills programme that targets this group.

c. Repeat with the next target group.

Who? (Which target groups)

1. _____

2. _____

3. _____

4. _____

5. _____

Where will the learning take place? Which **channels** can provide opportunities for this group?

What are the **needs** -- technical and non-technical -- for this population group?

What

Where

How

How will this group learn new skills? What **programmes** will be available to this population group?
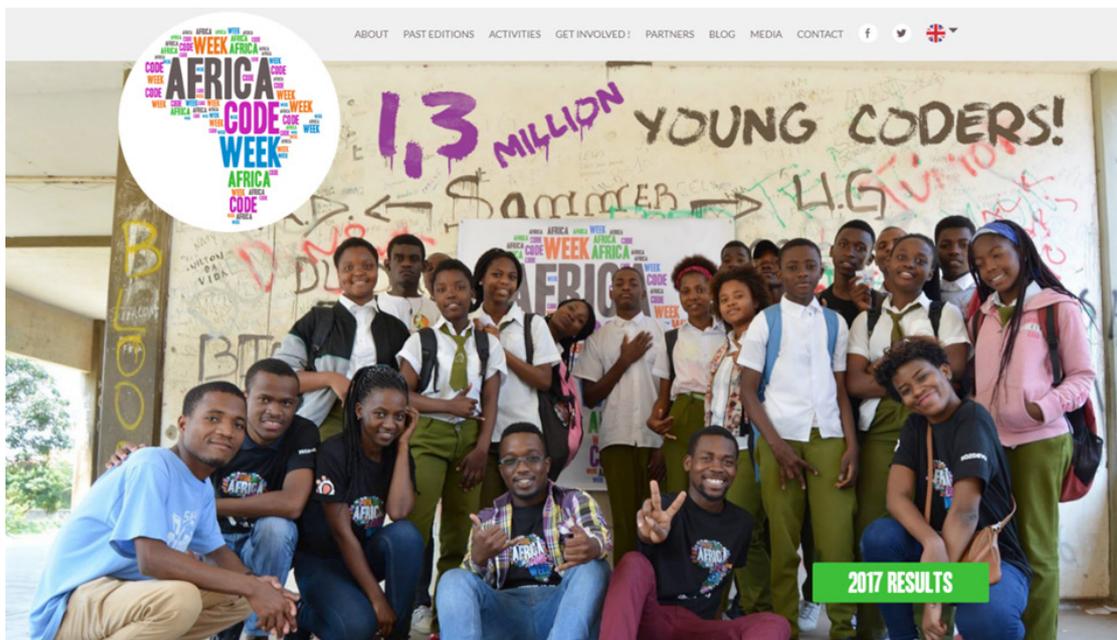
Chapter 8: Organizing campaigns and multi-stakeholder initiatives

This chapter covers campaigns and other multi-stakeholder initiatives as a means to building awareness, creating excitement, and otherwise motivating people to learn digital skills. Campaigns are particularly effective for focusing national attention, engaging partners, and launching major programmes. They can be global, regional, national, or local, and should always involve a wide range of stakeholders. Many campaigns include festivals, hands-on demonstrations, or other live events that can be held in a single location or across hundreds or thousands of voluntary sites. Countries often conduct campaigns to target populations that are at risk of being left behind – e.g. women, out of school youth, and persons with disabilities. This chapter also includes a tool to identify opportunities for organizing a campaign or multi-stakeholder initiative.

Telcel's Aldea Digital in **Mexico City** may be the world's largest national digital inclusion event, with over 420,000 participants in 2016, the event's 4th year.[1] The event encourages visitors to go online, many for the first time, and provides resources to help participants build their ICT proficiency and access education materials. At the 2014 event, more than 35,000 of the participants used a computer and email for the first time, and approximately 30,000 more received job training and participated in workshops for entrepreneurs.[2] This effort is part of the Digital Education and Culture Program Telmex-Carlos Slim Foundation, a project that "every day seeks to reduce the digital divide throughout the country, providing the population with digital knowledge in a totally free way."

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[1] http://aldeadigitalmx.com/conocenos
[2] http://www.prnewswire.com/news-releases/world-record-setting-258986-visitors-attend-telmexs-aldea-digital----infinitum-digital-inclusion-event-257196511.html

Africa Code Week aims to spread digital literacy across the continent and start shaping tomorrow's skilled workforce. The five-year goal of the campaign is to engage one million children and youth, and equip 200,000 science teachers with the resources they need to teach the subject. In 2016, the campaign engaged over 400,000 students across 30 countries, including a nearly 50% participation rate of girls in the coding workshops.[1]

Source: http://africacodeweek.org/

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[1]   http://africacodeweek.org/past-editions/2016-results/

A country may find that their digital skills strategy aligns with an existing regional or global strategy. At a regional level, the European Union for instance, has over the years developed a number of strategies that address digital skills. There are also a number of global strategies and campaigns that a country may have joined.

The ITU-ILO **Digital Skills for Decent Jobs for Youth Campaign** of the "Decent Jobs for Youth" global initiative aims to train **five million young people with job-ready transferable digital skills by 2030** to equip them with job-ready, transferable digital skills.

The campaign, which began in 2017, will incentivize a range of stakeholders to provide advanced and basic digital skills, soft skills and digital entrepreneurship training by:

•   Organizing digital skills development programmes for young people, such as coding bootcamps or mobile apps development trainings

•   Running advanced digital skills development programmes for young women

•   Training young entrepreneurs on how to use ICTs to grow their businesses and learn the business, technical and soft skills they need as digital entrepreneurs

•   Including digital skills training in apprenticeships and educational and professional development programmes across sectors

- Training education providers how to adapt school curricula and incentivize professional development, entrepreneurial activities, on-the-job learning and job insertion of youth; and

- Providing financial support to existing digital skills development programmes or the creation of new ones[1]

How to join

To join and become a partner of Decent Jobs for Youth, stakeholders can submit commitments that contribute to the objectives of the Digital Skills for Decent Jobs for Youth campaign, while demonstrating how they will advance Sustainable Development Goals.

Commitments are concrete pledges to take joint action on youth employment at local, country, regional and global level in line with the initiative's strategy and guiding principles. Commitments towards Decent Jobs for Youth are recognized as direct contributions to the United Nations Partnerships for SDGs under the 2030 Agenda and linked to follow-up mechanisms, in particular to the High-level Political Forum on Sustainable Development.

Source: IT Step Academy

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[1]   For more information, see www.decentjobsforyouth.org and www.itu.int/digitalskills

Tool: organizing campaigns

The purpose of this tool is to identify opportunities for organizing a campaign or multi-stakeholder initiative.

First, what national objectives would a campaign or multi-stakeholder initiative target? Possible objectives include: to raise awareness, launch an industry partnership, target a population group or underserved area of the country, among others.

Campaign/initiative objectives
1.
2.
3.

Next, identify regional or global campaigns or multi-stakeholder initiatives that could be joined or offer a model for a national adaptation. Describe how the campaign/initiative would be relevant to the country context.

Regional or global campaign/initiative	Relevance to country

Lastly, generate a list of ideas for campaigns/initiatives in the country. These can include the regional or global campaigns above, or entirely new campaign possibilities. For each idea, consider how the campaign will achieve the objectives listed above.

Campaign/initiative title	Objectives	Description of idea

Chapter 9: Leveraging existing online training resources

This chapter highlights the opportunity of utilizing the tremendous range of training resources available online. Both the volume and quality of online learning resources increases daily. Massive Open Online Courses (MOOCs), YouTube videos, interactive learning modules, and many other resources are available on the internet, much of it free or at very low cost. Codecademy, for instance, provides free coding classes in twelve different coding languages, and has been used by over 25 million learners.[47] Khan Academy offers exercises, instructional videos, resources for parents and teachers, and other practical resources to provide free education to everyone.[48] Many of these resources are available in multiple languages, though English still dominates and many minority languages suffer from significant availability gaps.

These resources are benefiting both individuals and organizations that adopt and adapt these resources for more structured training programmes.

For motivated individuals, these resources have unlocked opportunities to learn every type of digital skill, and enable them to connect with others in online peer-learning environments. Countries can make significant progress by raising awareness of these resources. However, because many of these resources are bandwidth intensive, countries must also take steps to make broadband internet affordable and ensure there are places for people to access the internet (such as in community centres and public libraries).

Formal and non-formal educational institutions have also taken advantage of these resources to offer more structured learning programmes. Today, school teachers can use Khan Academy in the classroom, and librarians can offer coding classes in the library.

However, achieving this at scale requires these teachers, librarians, and other intermediaries to acquire new skills themselves. Specifically, they need to become information navigators, capable of finding, curating, and incorporating the most relevant resources for their population into their own training offerings. This capability has become more important even than becoming an expert in any specific area. Countries can ensure that teacher training and professional development programmes are re-oriented to focus on these navigational skills.

Public libraries and MOOCs

Peer-to-Peer University (P2PU) has worked with nearly a dozen public library systems in several countries to introduce learning circles — facilitated study-groups for adults who want to take online courses together, at the library.[1] Using free online course materials, groups of 4-20 adults meet with a librarian on a weekly basis to complete courses together. The programme provides a promising model for many learners who want to develop digital skills but need more structure than independent learning, and more freedom than in-school instruction.

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[1]   https://www.p2pu.org/en/

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[47]   www.codeacademy.com
[48]   www.khanacademy.org/

Chapter 10: Monitor, review and update

As stated at the beginning of the toolkit, technology is changing constantly, requiring new digital skills to succeed in life and work. This dynamic environment requires countries to establish targets, monitor digital skills programmes, establish processes for reviewing progress, and to perform periodic updates to national digital skills policies. This chapter covers different approaches and examples for conducting national skills assessments.

Where possible, countries should attempt to establish benchmarks. There are some efforts underway to institute national assessments benchmarked against the DigComp framework (see IKANOS example below), but the availability of data to conduct such benchmarking may not always be available. Countries may wish to consider the Broadband Commission recommendations below.

The ITU UNESCO Broadband Commission for Sustainable Development recommends that countries develop measurement and monitoring strategies that:

- Support national statistics agencies and other agencies in regularly collecting disaggregated digital skills data, including through individual assessments, to facilitate a more robust and comprehensive understanding of digital skill divides.

- Explore the possibilities of aggregated usage of automatically generated data on the use of digital platforms and services as a means of mapping patterns of digital competencies and skills.

- Include, where relevant, questions in annual household surveys to gather self-reported information about individuals' digital skill levels and digital skill needs. Also, encourage countries to share collected data with relevant international organizations, including UNESCO and ITU, to facilitate global and regional analysis.[1]

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[1]   Broadband Commission, page 62

National strategies – assessment and testing

Countries have several options for assessing the performance and impact of their digital skills programmes. Assessment strategies can be broken down into two approaches: self-reported and test-based.

Self-reported methods measure digital skills by asking participants to rate their own level of knowledge, ability, confidence, or experience (i.e. usage). Self-reported methods encompass the vast majority of assessment approaches currently available, in part because they lend themselves well to surveys. Two examples are the ITU household survey on ICT skills and IKANOS initiative to track digital skills to the DigComp 1 framework.

The ITU currently features one question in its ICT household survey on ICT skills. ITU's approach is based on the Eurostat model. Eurostat has been implementing the ICT Household Survey annually since 2007, with updates each year. The 2016 version of the survey asks the skills-related question: "Which of the following computer-related activities have you carried out in the last twelve months?"[49] Following this approach, if a person reports that they have carried out a particular task then they have the skills to do so.

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[49]   The Eurostat ICT Household Survey collects other data related to ICT use, including usage in enterprises. A list of related variables is available here:http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database

IKANOS Competencia Digital is an initiative developed by Spain's Basque Government to publicize the European Commission's digital competencies (i.e. DigComp) and various skills training opportunities with the aim of advancing the digital skills of the region's residents, increasing the region's competitiveness, and promoting general well-being. In alignment with DigComp 1, the assessment focuses on perceptions of skills and experiences related to five competence areas: Information, Communications, Content creation, Safety, and Problem-solving.

Test-based tools, on the other hand, ask right/wrong questions and score participants' results based on their proportion of correct answers. Test-based tools measure ICT skills using knowledge-based and task-based approaches. For instance, these tools may test knowledge via multiple-choice questions or test task completion via a single, multi-step, problem-solving module. Test-based tools are administered on a computer, not through paper surveys. Three examples include:

- The International Computer and Information Literacy Study (ICILS) is a project of the International Association for the Evaluation of Educational Achievement. It measures international differences in computer and information literacy – i.e., students' "ability to use computers to investigate, create, and communicate in order to participate effectively at home, at school, in the workplace, and in the community."[50] It was first administered in 2013 in 21 countries and a similar number have indicated an interest in participating in 2018.

- The Programme for the International Assessment of Adult Competencies (PIAAC) is a project of the OECD that "aims to measure the set of literacy, numeracy, and technology-based problem-solving skills an individual needs in order to function successfully in society." It has been administered in most OECD countries, as well as several others (Ecuador, Indonesia, Kazakhstan, Lithuania, Peru and Singapore,) and is currently in its third round of data collection (2016-2019).

- Australia's National Assessment Program (NAP) is another digital skills assessment model. The NAP is managed by the Australian Curriculum, Assessment and Reporting Authority (ACARA). NAP tests students' skills and understanding in science literacy, civics and citizenship and information and communication technology (ICT) literacy. The assessment of ICT literacy is part of a national plan to monitor and report on student achievement progressively against the National Goals for Schooling in the Twenty-first Century. General ICT skills and knowledge are assessed rather than the more technical skills and knowledge developed through specialist ICT courses.[51]

In addition to these national approaches, many curricula include assessment components, such as the Microsoft Digital Literacy Certificate Test.[52]

Selecting an appropriate approach

All of the assessment strategies and tools have characteristics that most countries may find useful. Criteria for evaluating the tools include:

- Skills coverage: what skills does the tool cover? Are the skills updated over time?

- Test-based or self-reported: test-based tools provide a more accurate picture of people's digital skills levels, but they are typically more complicated and costly to administer.

- Frequency of implementation: how often is the test administered?

- Target population: some tools are oriented for adults to capture the skills of people currently in the workforce; others for youth as a leading indicator of skills that the country will need to foster.

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[50] The assessment framework for the ICILS is available at: https://www.acer.edu.au/files/ICILS_2013_Framework.pdf
[51] More information about NAP's ICT Literacy Assessment: http://www.nap.edu.au/nap-sample-assessments/ict-literacy
[52] https://www.microsoft.com/en-us/DigitalLiteracy/

- Administration: some tools are administered as part of a national household survey. Others can be administered directly through the channels (schools, libraries, etc.) where people learn digital skills.

Chapter 11: Sample digital skills roadmaps

Some of the most extensive efforts to advance digital skills have been undertaken in Europe.

As part of its New Skills Agenda for Europe, the European Union is launching the Digital Skills and Jobs Coalition featuring a guidance document on creating skills strategies that contains many national examples. The United Kingdom's Digital Strategy illustrates the approach one country is taking to advance digital skills. In addition, some private sector companies have issued digital transformation roadmaps for the countries in which they do business – for example Telenor's Realising Digital Myanmar plan. These are just some examples that countries can turn to when developing or revising their digital skills strategies.

Shared concept for national digital skills strategies - European Commission

The European Commission is launching the Digital Skills and Jobs Coalition to tackle growing digital skills deficits in Europe and provide all EU citizens with the skills they need to thrive in a digital economy and society. The initiative seeks to develop a large digital talent pool and ensure that individuals and the labour force in Europe are equipped with adequate digital skills.[53]

The European Commission's New Skills Agenda for Europe has encouraged each EU Member State to develop its own comprehensive national digital skills strategy. The shared concept document provides a guide for just that: writing, revising, and improving national strategies, particularly to address digital skills gaps in Europe. It contains a discussion on challenges and possible solutions, as well as a wide variety of best practices, with sections focusing on:

- education and training;
- citizens;
- the labour force;
- ICT professionals.

Access the European Commission's Shared Concept for National Skills Strategies here: https://ec.europa.eu/digital-single-market/en/news/shared-concept-national-digital-skills-strategies

United Kingdom digital strategy 2017

Every individual and every business should have the skills and confidence to seize the opportunities of digital technology and have easy access to high-quality internet wherever they live, work, travel or learn…. By putting each of the elements of this strategy in place, we will cement our position as a world-leading digital economy and ensure it works for everyone[54]

(UK Digital Strategy 2017)

In March 2017, the United Kingdom released a plan to build digital skills for the digital economy: UK Digital Strategy 2017. The plan provides a framework comprised of several elements, from improved digital infrastructure to balancing innovation and protection in data analytics. The sections include:

1. building world-class digital infrastructure for the UK;

2. **giving everyone access to the digital skills they need;**

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[53]   https://ec.europa.eu/digital-single-market/en/news/shared-concept-national-digital-skills-strategies
[54]   Access the UK Digital Strategy 2017 here: https://www.gov.uk/government/publications/uk-digital-strategy/uk-digital-strategy#executive-summary

3.   making the UK the best place to start and grow a digital business;

4.   helping every British business become a digital business;

5.   making the UK the safest place in the world to live and work online;

6.   maintaining the UK government as a world leader in serving its citizens online;

7.   data - unlocking the power of data in the UK economy and improving public confidence in its use.

Section 2, which focuses on skill-building, highlights new initiatives, existing programmes, and past successes in the UK, including a variety of formal and non-formal learning approaches for basic and more advanced digital skills. One of the most ambitious new developments is the creation of a new Digital Skills Partnership that aims to provide four million free training opportunities over the next few years through cross-sector partnerships – and it includes skill-matching to prepare people to fill job vacancies locally.[55] Access the UK Digital Strategy 2017 here: https://www.gov.uk/government/publications/uk-digital-strategy/uk-digital-strategy#executive-summary.

Realising Digital Myanmar

Telenor's *Realising Digital Myanmar* is a private-sector view of a roadmap for the country's digital transformation over coming years up to 2023. It includes seven focus areas: digital frameworks, digital infrastructure, digital ecosystems, digital skills, digital government, digital enterprises and digital consumers. Each focus area identifies a series of targets to be reached by 2023 such as training all civil servants in digital literacy and integrating Scratch coding in schools[56]. This roadmap identifies digital skills as one of the requirements for fostering a thriving digital economy benefitting all sectors. The government has also created a Digital Economy Development Committee to develop a master plan for the nation's digital transformation. At the time of publication of this toolkit, this master plan was under preparation. Once published, it too, may offer an example of a digital skills roadmap for reference by other countries.

[55]   https://www.gov.uk/government/news/digital-strategy-to-make-britain-the-best-place-in-the-world-to-start-and-grow-a-digital-business
[56]   https://www.telenor.com.mm/AttachFile/Telenor_digital_myanmar_wordversion_20180126.pdf

Chapter 12: Future developments and emerging trends

We are living in a time of remarkable technological development, the digital transformation enabled by artificial intelligence, big data analytics, cloud computing, Internet of Things and robotics. Predictions abound about how these new technologies will change the future of work and life in the digital economy. They have already given rise to new ways of working, including digital entrepreneurship and digital freelancers.

Some countries, seeking to capitalize on these developments, are offering new advanced digital skills training programmes to ensure their citizens are prepared for future jobs. India, for example, launched its Futureskills platform in February 2018 to upskill two million technology professionals and two million other future employees and students in the coming years, including training employees from other economic sectors. The platform provides training on the technical development of artificial intelligence, big data analytics, cloud computing, Internet of Things, 3Dprinting and virtual reality. Billed as a "one-stop shop", the platform identifies both high-demand career paths and skills gaps and offers training, assessment and certification to prepare graduates for applying for jobs requiring these skills[57]. This public-private, cross-sectoral and demand-driven approach to building advanced digital skills within a framework of lifelong learning could be a model for other countries to consider.

As countries periodically review their digital skills strategies, they will seek to track new technological developments, the new skills needed by specialists to develop these technologies, the skills needed by everyone to use these technologies in life and work, as well as the new opportunities and new ways of working that they enable. Countries are encouraged to refer to existing and forthcoming studies and analysis to guide their work [58].

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[57] Nasscom http://www.nasscom.in/sites/default/files/media_pdf/honble-prime-minister-narendra-modi-unveils-futureskills-platform-to-upskill-technology-professionals-in-india.pdf

[58] Some reports have already been published on the future of work such as Accenture's 2017 *New skills now, inclusion in the digital economy.* https://www.accenture.com/t20171011T185302Z__w__/us-en/_acnmedia/PDF-63/Accenture-New-Skills-Now-Inclusion-in-the-digital.pdf. Other topics, such as digital entrepreneurship, are the subject of current analysis, including the aforementioned Broadband Commission Working Group on Digital Entrepreneurship, expected to publish its initial findings in 2018 http://www.broadbandcommission.org/workinggroups/Pages/Digital-Entrepreneurship.aspx .

Conclusion

Digital skills are now a prerequisite for anyone in any country to participate meaningfully in the growing digital economy and society. This toolkit has aimed to equip policymakers and other stakeholders with practical guidance for developing a digital skills strategy tailored to individual country needs. While there is no one-size-fits-all strategy – each country has unique strengths and goals – there are a number of promising approaches that have proved their worth in many contexts, offering every country a range of models to explore and adapt. It is hoped that the tools are useful in sparking discussions leading to concrete steps through new policies and programmes.

It bears repeating here that countries can use the toolkit in its entirety in developing a comprehensive digital skills strategy or they can simply focus on a specific area and use elements from the toolkit as appropriate to particular needs – for example how to target under-represented groups

The ITU is pleased to share this toolkit, and is keen to support members as they strive to equip their citizens with the digital skills they need to thrive in the 21st century.

Glossary

Very few of the terms below are internationally agreed. Footnotes have been provided for definitions included the ITU terminology database. Other definitions are based on those found online, such as the Cambridge English Dictionary at https://dictionary.cambridge.org/dictionary/english/ for which references have also been provided. Terms without references are informal descriptions provided for the ease of users in reading this toolkit. As terms are continuously evolving, users are encouraged to consult several online sources for the most current usage.

Accelerators: For-profit incubators that support start-ups with funding and other services in exchange for equity.

Apps: Software application developed for a digital device. The term is often associated with the applications that run on mobile phones.

Artificial Intelligence: the study of how to produce machines that have some of the qualities that the human mind has, such as the ability to understand language, recognize pictures, solve problems, and learn.[59]

Big data: very large sets of data that are produced by people using the internet, and that can only be stored, understood, and used with the help of special tools and methods.[60]

Cloud computing: A paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with on-demand self-service provisioning and administration[61].

Coding: Writing instructions for a computer programme.

Full-stack developer: A term which commonly refers to someone who can work both on front-end and back-end web or application development, with front-end being what the user sees and interacts with and the back-end handling the core functional logic of the application.

Incubators: Programmes that support start-ups through business support services and resources.

Internet of Things (IoT): A global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies[62].

Makerspace: a place in which people with shared interests, especially in computing or technology, can gather to work on projects while sharing ideas, equipment, and knowledge.

Massive open online courses (MOOCs): Online courses featuring limitless or large-scale participation and open access.

Micro-controllers: a small, low cost, computer such as an Arduino or Raspberry Pi device that can be used to teach people coding and other digital skills.

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[59]   https://dictionary.cambridge.org/dictionary/english/artificial-intelligence
[60]   https://dictionary.cambridge.org/dictionary/english/big-data
[61]   https://www.itu.int/net/ITU-R/asp/terminology-definition.asp?lang=en&rlink={607102F9-70B4-49F1-81EC-B8784E49E494}
[62]   https://www.itu.int/net/ITU-R/asp/terminology-definition.asp?lang=en&rlink={42AA741E-A0A7-48C4-905B-AAAFDA29E5F2}