March 2021

Part 1

Digital Skills

The Why, the What and the How

#DE4A

Methodological Guidebook V 2.0 for Preparing Digital Skills Country Action Plans for Higher Education and TVET

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DIGITAL SKILLS

PASET Partnership for Skills in Applied Sciences, Engineering & Technology

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DIGITAL DEVELOPMENT PARTNERSHIP

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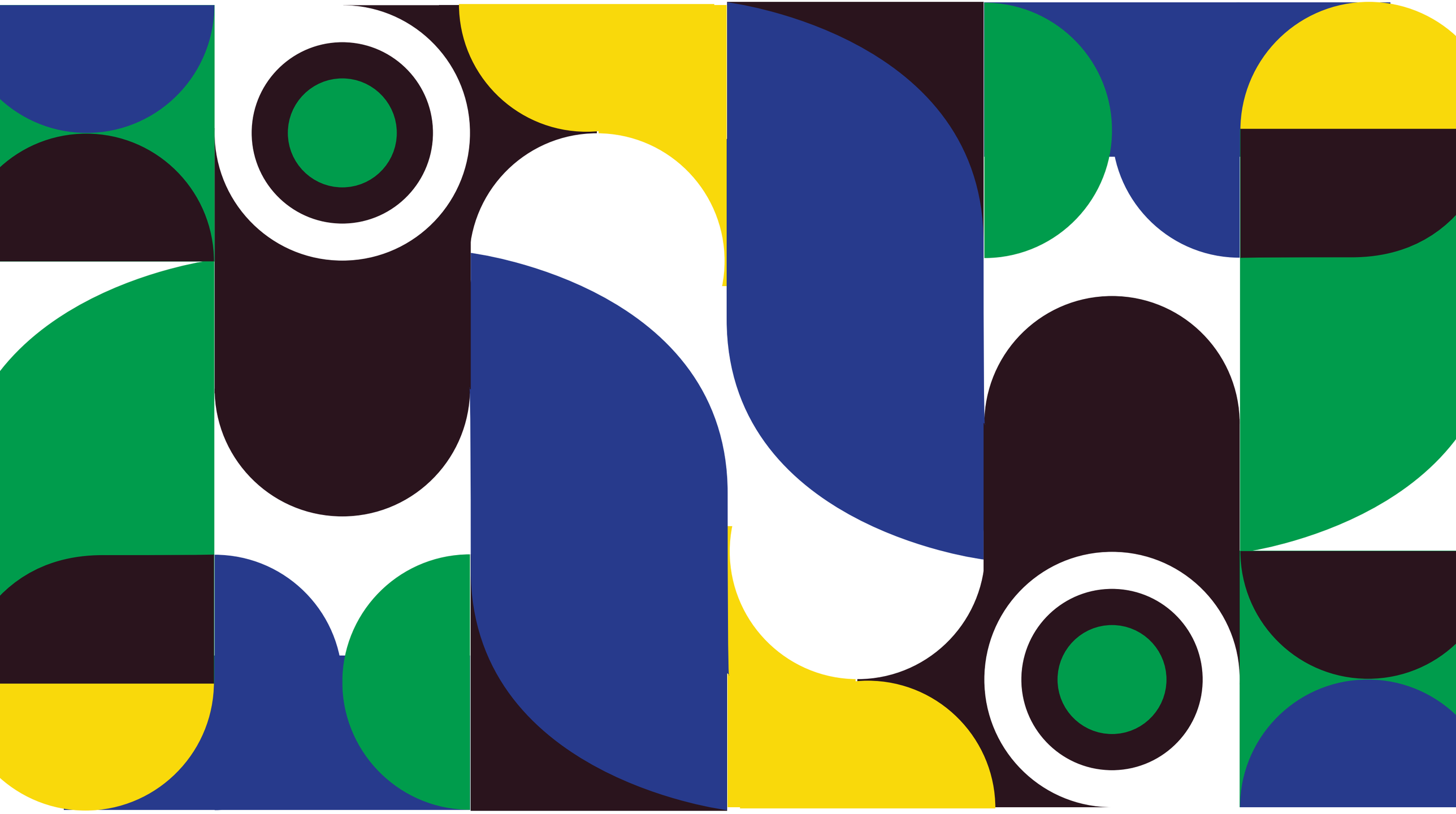

Acknowledgements

"Digital Skills: The Why, the What, and the How" Methodological Guidebook for Preparing Digital Skills Country Action Plans for Higher Education and TVET (V2.0), was prepared as part of the Digital Economy for Africa (DE4A) initiative of the World Bank Group, with funding from the Digital Development Partnership (DDP), a multi-donor trust fund facility hosted in the Digital Development Global Practice, and under the overall guidance of the Partnership for Skills in Applied Sciences, Engineering & Technology (PASET).

V1.0 of the Guidebook was prepared in November 2019 and used in the first two workshops in Mozambique and Rwanda, as well as in the virtual workshops in Ethiopia in the first half of 2020. V2.0 of the Guidebook, prepared in December 2020, builds on experiences and lessons learned from using the guidebook in the three countries mentioned above. The substance of the Guidebook remains the same. Key areas that have been revised or clarified in V2.0 include: a) an explanation of the contextualized approach to implementation; b) link with DE4A diagnostic tools; c) suggestions for regional collaborations; and d) baseline indicators. V2.0 also incorporates a second volume with more detailed guidelines for each strategy.

The Guidebook (V1.0) was prepared by a team led by Sajitha Bashir (Adviser, Office of the Global Director for Education, World Bank) and Samia Melhem (Global Lead, Digital Capabilities, World Bank). Inputs were provided by Jorgen Billetoft (Labor market and Skills development Specialist) – demand assessment and reform of digital skills programs; Liz Arney (Education and Technology Specialist) - use of technologies in teaching and learning; Javed I. Khan (Professor, Kent State University, Ohio) – development of National Educational and Research Networks and broadband connectivity; Victor Lim (Assistant Professor, Nanyang Technological University, Singapore) – capacity development of and business process re-engineering in Ministries of Education/ Higher Education and regulatory bodies; Senthil Kumar (Programmes Manager, Global e-Schools and Communities Initiative) - web-based costing tool for estimating the costs of various strategies and Dmitry Chugunov (Consultant, World Bank) – development of the Costing Template for Scenario Planning. Joanna Sundharam (Consultant, World Bank) and Sharon Zacharia (Consultant, World Bank) undertook background research and provided overall support. Steve Huter (Director, Network Startup Resource Center) provided inputs on broadband infrastructure and connectivity at the initial stages of preparation of the Guidebook. Arun Sharma (Founder, Infinite Potentials) ensured overall coordination and editing of the various inputs. Errica Mallozzi (Founder, Metapict) led creative design and developed the graphics and layout for the Guidebook and related communication materials. Aline Bazouni (Founder, TRADINCO S.A.R.L) translated the Guidebook and supporting materials to French.

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The team is grateful for the guidance and feedback received from Boutheina Guermazi (Global Director, Digital Development Global Practice), Jaime Saveedra (Global Director, Education Global Practice) and Michel Rogy (Practice Manager, Digital Development). V2.0 incorporates extensive feedback received from peer reviewers - Elizabeth Ninan (Senior Education Specialist); Alex Twinomugisha (Senior Education Specialist); Ruth Charo (Senior Education Specialist); Ekua Bentil (Education Specialist); Tim Kelly (Lead Digital Development Specialist; Ana Menezes (Senior Education Specialist); and Girma Woldetsadik (Senior Education Specialist) in the Education Global Practice and Digital Development Global Practice of the World Bank and Salah-Eddine Kandri (Principal Investment Officer) from IFC. Both versions of the Guidebook have benefitted from the insightful comments and detailed feedback from the PASET Consultative Advisory Group.

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WITH SUPPORT FROM:

The work on the Digital Skills Country Action Plan was made possible by the generous support of the members of the Digital Development Partnership – the World Bank's program helping developing countries leverage innovation and technology to solve their most pressing challenges. For more information, please visit: https://www.worldbank.org/en/programs/digital-development-partnership.

Abbreviations and Terminology

AI	Artificial Intelligence
CAPEX	Capital Expenditure
CSO	Civil Society Organizations
CSR	Corporate Social Responsibility
DE4A	Digital Economy for Africa
DGLF	Digital Literacy Global Framework
EU	European Union
GER	Gross Enrollment Ratio
GESCI	Global E-Schools and Communities Initiative
ICT	Information and Communication Technology
IFC	International Finance Corporation
IoT	Internet of Things
IT	Information Technology
MOOC	Massive Open Online Courses
MoREN	Mozambique National Research and Education Network
NGOs	Non-Governmental Organizations
NREN	National Research and Education Networks
OER	Operation Education Resources
OPEX	Operational Expenditure
OPM	Online Program Manager
PASET	Partnership for Skills in Applied Sciences, Engineering and Technology
SCORM	Shareable Content Object Reference Model
SLOER	Sierra Leone Open Educational Resources
STEM	Science Technology Engineering and Mathematics
TVET	Technical-Vocational Education and Training
UNESCO	United Nations Educational, Scientific and Cultural Organization
UVS	L'Université virtuelle du Sénégal (Virtual University of Senegal)

1 Executive Summary

This Methodological Guidebook is a resource to help countries in Africa prepare a Digital Skills Country Action Plan for higher education and technical vocational education (TVET), which focuses on the rapid development of Digital Skills amongst young people through coordinated strategies on several fronts. While the focus is on developing digital skills proficiency at the intermediate and advanced levels for students in higher education and TVET, its approach can also be adapted to school education. It has been prepared as a follow up to the conclusions of the 5th Forum of the Partnership for Skills in Applied Sciences, Engineering and Technology (PASET)[1] in May 2019 under the theme of Destination Digital Africa: Preparing our Youth for the Future and as part of the World Bank led Digital Economy for Africa initiative, which supports the Digital Transformation Strategy of the African Union.

1 https://www.worldbank.org/en/events/2019/04/22/5th-paset-forum

1.1 Expected Outcomes

The Digital Skills Country Action Plan,[2] will set goals up to ten years with measurable targets and lay out strategies, activities, costs, and a detailed implementation plan covering the period five years to achieve these goals and targets.[3] Preparation of a costed Plan will help countries to set priorities in how to train young people at scale in digital skills, in line with current and projected future demand. The plan would also provide countries with a roadmap to achieve their goals and enable them to identify the resources that are required.

The Methodological Guidebook supports country planning teams to develop these plans by beginning with a systematic assessment of the current and expected changes in demand for digital skills at various levels as well as of the current supply. It builds on work undertaken for the 5th PASET Forum (including completion by countries of questionnaires on country readiness) and the Digital Economy Country Diagnostic Assessments undertaken by the World Bank in several countries, which provide rich sources of background information. It supports the development of the Country Action Plans by covering coordinated actions in five strategic areas:

- The development of enabling policies for the development of Digital Skills, a Digital Skills Framework customized for each country (adapted from global frameworks), and a system of Digital Skills assessments.

- Reform of priority Digital Skills education and training programs in higher education and TVET institutions (including introduction of new programs). This includes Digital Skills courses at the intermediate level for students in all courses and, at the advanced level, reform of electrical engineering, computer science and other engineering, science and mathematics programs.

- Enhanced use of online courses and integration of a range of digital tools, from the most basic to sophisticated, in teaching-learning across selected courses

- Increased and affordable high-speed broadband connectivity in research and educational networks at the national as well as higher education and TVET institution levels. Improved development and management of campus networks and infrastructure.

- Capacity building of staff and development of efficient and digitally enabled business processes in Ministries of Higher Education/TVET/Education and relevant national authorities (such as the Higher Education or TVET authorities).[4]

2 Henceforth, the reference to higher education and TVET sectors is implied throughout the Guidebook.
3 V1.0 of the Guidebook recommended that teams set goals for 2020-2030 and undertake detailed planning for 2020-25

4 Designations of Ministries and authorities vary across countries.

Each Digital Skills Country Action Plan should be costed to guide budget allocations and countries can use this plan to mobilize external financing from different sources, including external donors and the private sector. The private sector can be an important partner in delivering Digital Skills training as well as in the use of technology. The World Bank is developing regional Digital Skills projects as well as a number of national projects with Digital Skills components. The Digital Skills Country Action Plans could help countries access these sources of financing.

While Plans are developed at the national level to help set priorities and mobilize funding, and some activities (such as development of policies and frameworks) need to be conducted at the national level, implementation of several important strategies and activities will be at the level of the higher education and TVET institutions (as well as at the level of key regulatory authorities and quality assurance agencies).

1.2 The Imperative of Developing Digital Skills in Africa

Breathtaking developments in new digital technologies are re-shaping economies and nations. Examples of these are 5G wireless communications, smartphones, mobile computing, quantum computing, cloud storage, big data, Artificial Intelligence (AI), blockchain, virtual/augmented reality, Internet of Things (IoT) and the Industrial Internet of Things. These technologies, in particular through the use of big data and AI, will drive advances in physical and biological technologies, in areas such as 3-D printing, new materials, energy conversion and storage, biotechnology and advanced robotics. The convergence of multiple technologies will radically transform the organization of economies and how people live and work. It also holds the promise to address Africa's pressing economic and social development challenges. Significant deficits in infrastructure, technology, and skills in many African countries presently put these economies at risk of lagging further behind amidst a rapidly shifting digital frontier. Digital Skills represent a continuum from basic to intermediate, advanced and highly specialized skills. Digital Skills can also be distinguished according to functional needs: for citizens, for a wide range of occupations using digital technologies, and for the ICT professions. While Africa faces a shortage at all levels, shortages of general digital skills at the intermediate and advanced level, as well as intermediate and advanced digital skills for the ICT professions, are expected to become more critical as economies grow which can impede the uptake and application of digital technologies.

The Digital Skills Country Action Plan will lay out ambitious but realistic national goals for developing Digital Skills at the intermediate and advanced level for general occupations and ICT professions. Further, instead of standalone activities, the Plan will detail coordinated action in 5 strategic areas. A Digital Skills Country Action Plan, which focuses specifically on the goal of raising Digital Skills will supplement existing national ICT and Broadband strategies (including "ICT in education" strategies). In many cases, these may not be sufficiently operational, are often not costed, and are mostly focused on provision of infrastructure and devices, rather than on digital skills outcomes. A time horizon of five years is proposed to undertake detailed planning, but countries should have a roadmap up to about ten years as many activities will require time to begin implementation.

1.3 Steps in Preparing the Digital Skills Country Action Plan

1.3.1 Setting up a Country Planning Team

Planning requires strong leadership, technical expertise, and resources. A Country Planning Team, reporting to the Minister(s) responsible for Higher Education and TVET, should be constituted with the right technical expertise. The Ministry of ICT and its related agencies should be involved in the planning to ensure coordination with digital infrastructure expansion. Working groups should be constituted in each strategic area along with a costing working group, comprising technical experts and representatives of key stakeholders. Representatives from civil society and the private sector may be invited to participate as appropriate, including for the assessment of demand.

1.3.2 Assessment of Demand for Digital Skills and Current Status of Provision

The first step in preparing the Digital Skills Country Action Plan is to assess the current and forecasted demand for Digital Skills, as well as the current status of provision of Digital Skills education and training programs. The Guidebook proposes methods for making these assessments, particularly in view of the lack of reliable, quantitative data in many African countries. As countries are at very different stages in their development, this step is extremely important to set realistic goals.

1.3.3 Setting Ambitious and Realistic Goals for Digital Skills Development

Every country will need to be ambitious, but the starting point differs widely, as does the expected growth in the use of digital technologies in the economy. The Guidebook proposes a first level iteration of the Plan, using three scenarios corresponding to different "levels of ambition" for the development of Digital Skills and for critical activities in the 5 strategic areas based on key data and a relatively simple spreadsheet-based costing tool.

The country planning team should make its recommendations to the Minister or relevant authority to take a decision on the desired scenario. More detailed planning should be undertaken for the agreed upon scenario.

1.3.4 Detailed planning within each strategic area

A feature of the Digital Skills Country Action Plan is the development of activities in coordinated strategies. The expectation is for these strategies to be implemented in a coordinated manner as each strategy plays a complementary role in the overall success of the plan. An overview of each strategy is provided in the following sections.

Enabling policies are critical for the success of the Digital Skills Country Action Plan (DSCAP).

🟡 Strategy 1 - Establish enabling policies and develop a Digital Skills framework:

This strategy provides a foundation for the Digital Skills Country Action Plan and will underpin the success of the other strategic areas. Specific activities that can be included in the plan are:

- Develop enabling policies and regulatory frameworks relevant to the digital economy in areas specific to Digital Skills (curricula reform, digital content, e-learning standards, intellectual property rights). The Plan can also identify activities to develop agile policies and regulations in higher education/ TVET authorities and institutions to allow for approval of new courses, involvement of the private sector and adaptation to rapidly changing circumstances.

- Develop a national Digital Skills Framework, to be used by individuals, education providers and employers to identify Digital Skills required in various occupations. The Guidebook proposes adaptation of international frameworks such as the E-competence framework (developed by European Union) and UNESCO's Digital Literacy Global Framework (DLGF), so that they are relevant for the local environment while being benchmarked to global standards.

- Develop a Digital Skills Assessment system, based on the Digital Skills Framework to assess the skill level of students. This would also include decisions about coverage and modalities of implementation.

🟢 Strategy 2 - Reform of Digital Skills programs:

The Guidebook proposes that countries should consider five main areas within this strategy.

- First, enable all students in higher education and TVET institutions, irrespective of the specific course they are studying, to acquire at least intermediate level general Digital Skills.

- Second, prioritize reform of electrical and computer science and related programs at the undergraduate level, as they are critical for ICT professions and to many core sectors in the digital economy.

- Third, selected postgraduate courses (Masters and PhD level) should be expanded and reformed to produce graduates with highly specialized Digital Skills, as well as trained faculty for new programs.

- Fourth, undertake reform of key courses at the TVET level, in particular courses related to ICT professions like, installation and maintenance of digital equipment and infrastructure, and information security.

- Fifth, partnerships with the private sector should be built for rapid skilling programs to meet shortages and spikes in demand in particular areas.

🟢 Strategy 2 is closely related to 🔵 Strategy 3 and 🔴 Strategy 4. Implementation of 🔵 Strategy 3 will primarily be at the institutional level while the Digital Skills Country Action Plan will set priorities that can be used to decide on funding allocations and creating incentives for institutions to participate.

● Strategy 3 - Enhance use of technologies in teaching and learning:

The Guidebook proposes activities in two main areas:

- Expand and improve online courses: This can be used to rapidly advance digital literacy and skills at the intermediate level (as proposed in ● Strategy 2) and can also be used more broadly to enhance access to higher education and TVET. As online courses are often characterized by lower retention and completion rates, the Guidebook proposes setting quality standards, setting up dedicated Instructional Design units, increasing access to devices and data bundles, establishing learning centers, creating incentives, and enhancing interaction between students and faculty. The use of Online Program Managers (OPMs) versus developing in-house capacity should be carefully considered.

- Expand and improve the use of technology for teaching and learning in classrooms. The integration of technology in the classroom at scale can be a difficult and prolonged task necessitating the right policies, recruitment of dedicated leadership and implementation of technical support systems. A few courses should be selected for enhanced use of technology in learning, possibly those prioritized under ● Strategy 2. Identification and procurement of the appropriate technology and devices for students and faculty, investment in faculty development and technical support, creation of incentives for faculty adoption and data collection, and lessons learned in implementation experience are critical activities.

● Strategy 3 can greatly support ● Strategy 2, but its success will depend on the extent of internet connectivity and should be coordinated with the roll out plan of ● Strategy 4.

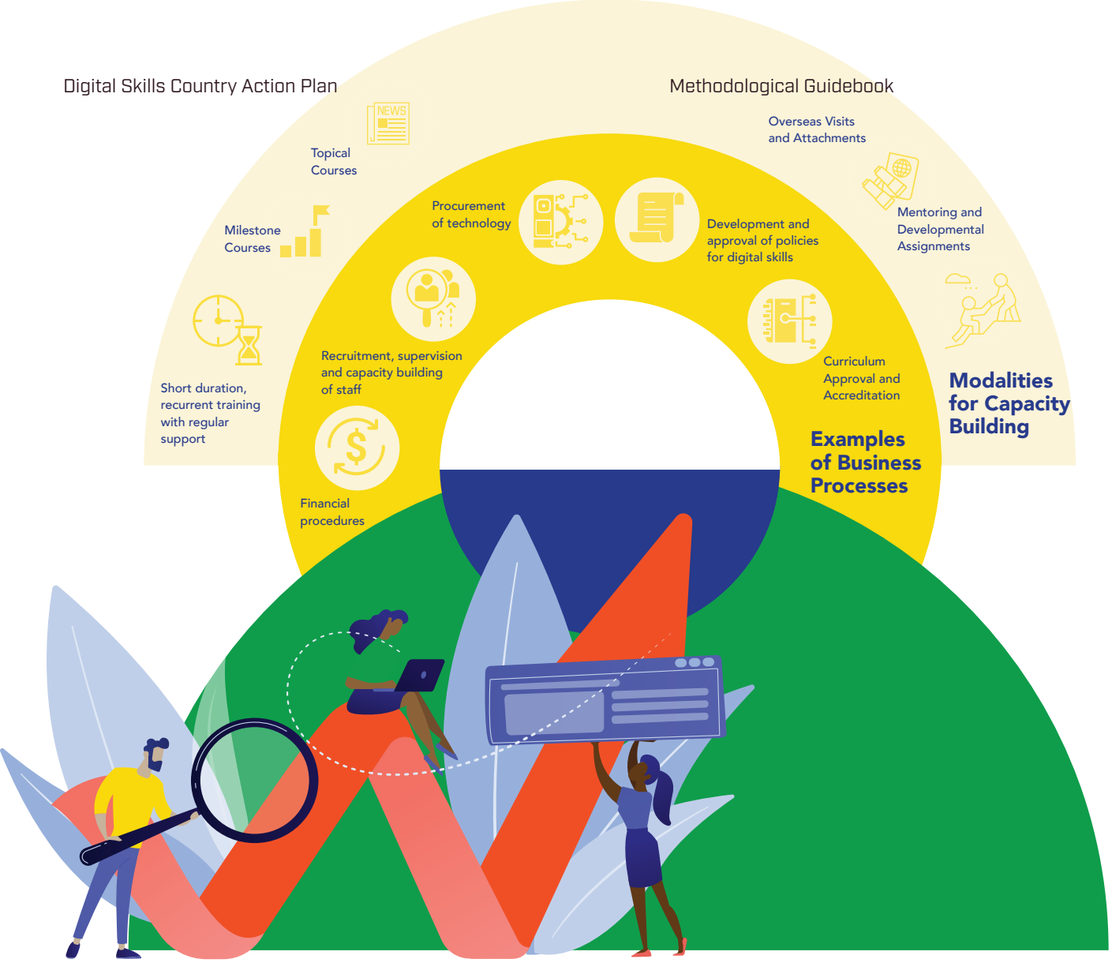
● Strategy 4 - Connect higher education and TVET institutions to affordable high-speed broadband.

The Guidebook proposes activities under two areas:

- Strengthen or establish National Research and Education Networks (NRENs): The purpose of this activity is to ensure abundant and reliable digital connectivity to higher education and TVET institutions using the emerging national research and education networks and their tiered regional and international interconnectivity. This will include technical, management and human resource plans.

- Modernization of Campus Networks and IT preparedness at the campus level: This activity is aimed to provide access to effective broadband and to bring digital services to faculty and students in higher education and TVET institutions. The Guidebook proposes that higher education and TVET institutions be classified into categories (small, medium, large, and research-intensive institutions) with norms for connection speeds, with a plan for modernization and management of the network and IT infrastructure for representative campuses from each category, to be used as a template. This can be used to develop the national compendium of campus network and digital services modernization plan.

- The Guidebook recommends development of a business plan for each campus to ensure sustainability, drive demand, take advantage of the latest advances to deliver effective educational services to the institutions. A governance plan at the institutional level enables institutions to stay attuned to the needs of faculty and students, and to ensure that the bandwidth is used mostly for education and research. A human resources plan should also include extensive training and indigenous capacity development scheme on how to properly staff the campus IT offices with the right technical and managerial expertise, including network engineers and learning technologists.



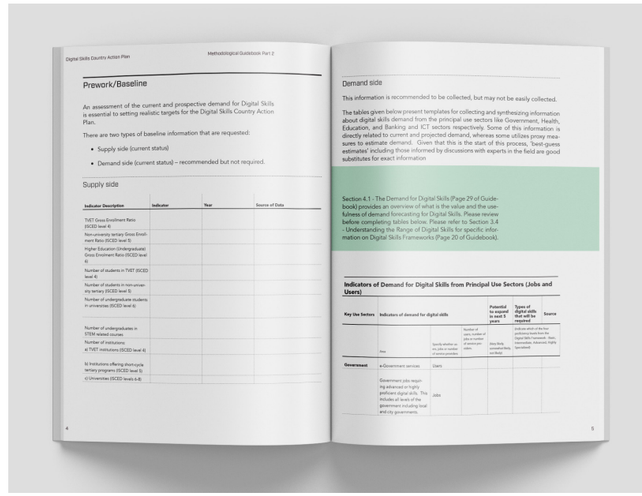
● Strategy 5 - Capacity building and business process re-engineering in Ministries:

The Guidebook proposes activities in two areas:

- Develop capacity in Ministries and relevant higher education/TVET authorities: This includes recruitment of the talent with Digital Skills capabilities and training in critical areas such as policy development, leadership and operations (including implementation of the Digital Skills Country Action Plan), selection of digital technologies, and procurement. Broad intermediate level Digital Skills training should be given to all staff.
- Business process re-engineering: Certain operational, management and support processes need to be re-engineered using digital technologies, including procurement, human resource management and financial management.

1.4 Costing of the Digital Skills Action Plan

A costing tool should be used to estimate the costs of the Plan, based on key cost elements such as human resources, facilities, software, equipment, technical assistance and materials. Accurate costing of action plans will allow line Ministries to request budgets for the proposed programs and activities from their Ministries of Finance, or from donors and development partners. The total cost of ownership of the selected technology, which includes recurrent as well as capital costs, is required for realistic budgeting. A web-based costing tool is proposed to simplify the process of estimating the Total Cost of Ownership (TCO)/ Operation.



1.5 Completing the Digital Skills Action Plan Template

The Guidebook provides a template that can be adapted by country planning teams to document the plan's activities, set out targets for goals and strategies and monitor indicators. Use of the common template allows comparisons and collaboration with other countries undertaking the same exercise.

1.6 Approval of the Digital Skills Country Action Plan and Implementation

The final Digital Skills Country Action Plan should be approved by the relevant authorities and be used as a tool to guide budget allocations and priority activities. Implementation of the plan should be monitored and adjustments made as required.

Additional Resources Available

See Volume 2.

2 Structure of the Guidebook

The Guidebook aims to support Country Planning Teams in the preparation of Digital Skills Country Action Plans which are clearly focused on the development of Digital Skills, rather than primarily on the use of technology in education. The aim of this Guidebook is to enable countries to create comprehensive, realistic and operational Digital Skills Country Action Plans that can help to mobilize and prioritize investment in Digital Skills. Digital Skills Country Action Plans will build on the goals, policies, strategies that each country has already developed in the area of ICT or ICT in education, specifically. The Guidebook focuses on Digital Skills Country Action Plans covering the development of Digital Skills amongst young people enrolled in higher education and technical-vocational education and training (TVET).

It is expected that this Guidebook will be used as a resource in the planning process, especially in the introductory phase, and consulted by the Country Planning Team and topic specific Working Groups as they develop their detailed Plans.

The Guidebook is divided into two parts.

Part 1 provides the rationale for and objectives of preparing a Digital Skills Country Action Plan, including its special characteristics; how to assess the demand for Digital Skills and the current state of provision of Digital Skills; guidance on how to set ambitious but realistic goals that are context specific for each country; a summary of the key strategies that countries should consider in their actions Plans, each of which are further elaborated in Part 2 (see below); and a summary of the process of costing the Plan.

Part 2 of the Guidebook is a separate volume comprised of detailed notes, which are accompanied by PowerPoint presentations to be used in the workshops with country teams. It provides detailed and technical guidance on the strategies that are introduced in Part 1, as well as on the costing methodology and tools.[1] The notes contain in-depth explanation of the strategies and substrategies, key activities for reaching high-level goals, how to develop an implementation plan, and identifying key milestones, partnerships, main cost elements. Guidance for each strategy is provided to the level of detail such that Country Planning Teams are able to develop realistic and accurate Digital Skills Country Action Plans. It also highlights key questions and issues to be addressed and incorporates examples from positive and negative experiences in designing and implementing these strategies, along with tips on how to address these issues.

The contents of each part are described in further detail below.

2.1 Part 1

Section 1 – Executive Summary

Section 2 – Structure of the Guidebook

Section 3 – Overview of the Digital Skills Country Action Plan: This section builds the rationale for countries to plan for developing Digital Skills amongst young people, in particular for Africa to benefit from the ongoing digital revolution, and how a Digital Skills Country Action Plan supplements existing more general policies and strategies to develop broadband and ICT, which many countries already have. It defines Digital Skills at different levels, identifies the five broad strategies considered important in this Guidebook, and indicates the steps to developing a good Action Plan

Section 4 – Digital Skills: Assessing Demand, Provision and Current Level amongst Students: This section provides guidance on how to assess the demand for Digital Skills and the current baseline on Digital Skills provision in higher education and TVET, as well as on private training providers, particularly in the context of limited direct information on key indicators.

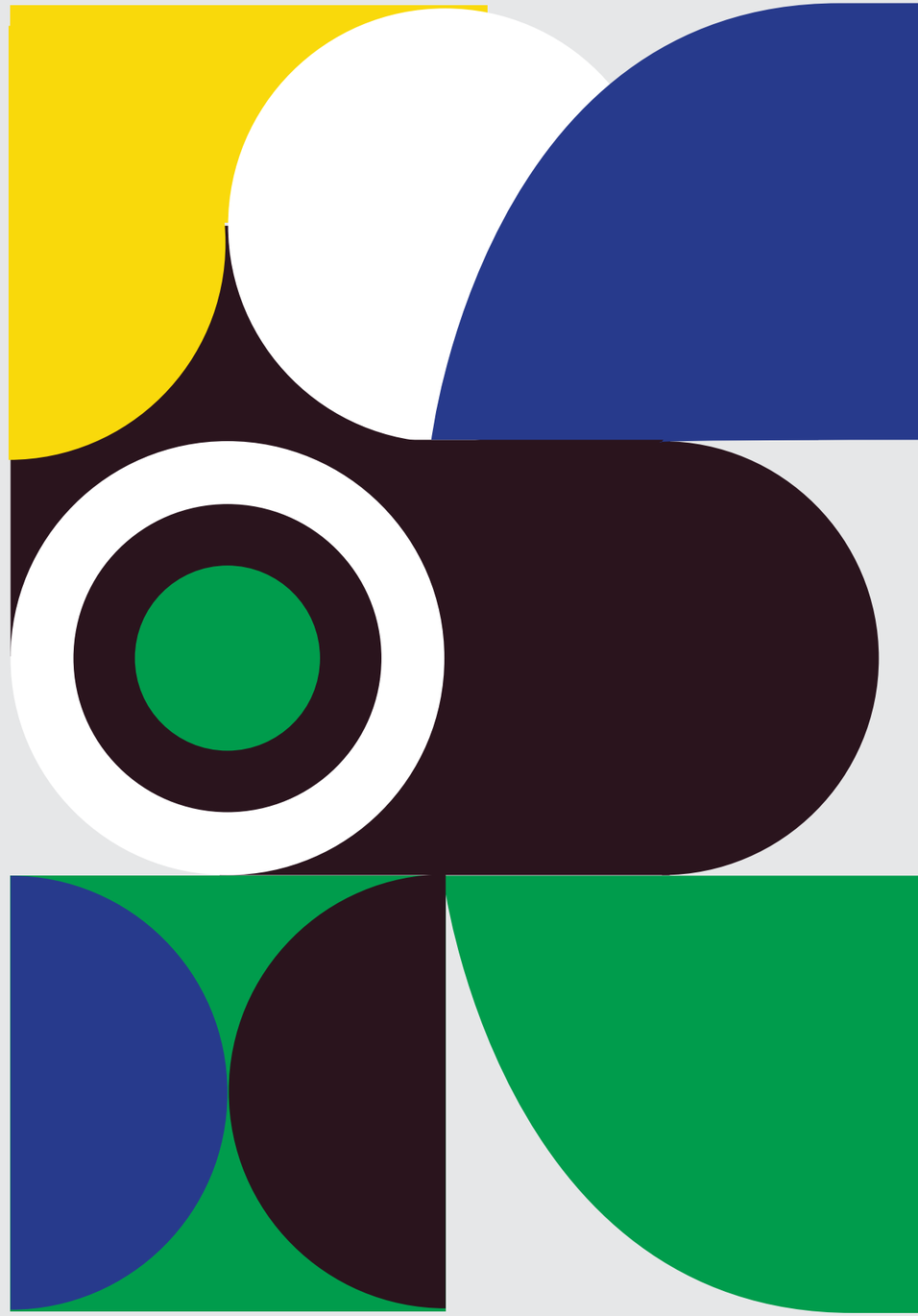
Section 5 –Setting Ambitious and Realistic Targets for the Digital Skills Country Action Plan: This section covers the process of setting targets for Digital Skills proficiency amongst learners, which is the focus of the Plan. This is the first step before detailed planning of individual strategies should be undertaken. This section presents an of overview of an Excel-based Costing Template for Scenario Planning for assessing three scenarios corresponding to different levels of ambition in targets, the financial resources and human resources required to attain these different levels of ambition, and the willingness or ability of the country to mobilize these resources.

Section 6 – Key Strategies for Developing Digital Skills: This section summarizes five key strategies that are considered essential to a comprehensive Digital Skills Country Action Plan, each of which are further detailed in Part 2. These strategies are (i) Establish enabling policies and develop Digital Skills Framework (ii) Reform of Digital Skills programs (iii) Enhance use of technologies in teaching and learning (iv) Connect higher education and TVET institutions to affordable high-speed broadband and (v) Capacity building and business process re-engineering in Ministries.

Section 7 – Costing of the Digital Skills Country Action Plan: The section highlights the fact that costing must be done in an iterative manner as the plan is developed and provides guidance on the stages.

Appendix 1: Prework Documents: This section contains tables that can be used by country teams to collect relevant information like projected demand for digital skills in various sectors and baseline information like current enrollment in various education institutions, number of faculty, etc. This information is used for developing different scenarios (see scenario planning tool) and detailed planning of various strategies during the workshop

Appendix 2: Process Documents: This section includes guidance on the composition of the overall Planning Group and Working Groups on each specific strategy. The section also includes suggested ToRs (Terms of Reference) for the members of the groups.



2.2 Part 2

As described earlier, Part 2 of the Guidebook is a separate volume comprised of detailed notes of the strategies, accompanied by PowerPoint presentations. It provides detailed and technical guidance on strategies as well as on the costing methodology so that Country Planning Teams are able to develop ambitious yet feasible Action Plans.

● **Strategy 1: Establish Enabling Policies and Develop Digital Skills Framework** – The detailed note and presentation explains process for the development of enabling policies for the development of Digital Skills, adapting a Digital Skills Framework, and setting up a system of Digital Skills assessments. The note also contains examples of important policies like E-content policies and Data Privacy policies.

● **Strategy 2: Reform of Digital Skills education and training programs** – This presentation provides a detailed explanation of how to reform of priority Digital Skills education and training programs in higher education and TVET institutions (including introduction of new programs). This includes Digital Skills courses at the intermediate level for students in all courses and, at the advanced level, reform of electrical engineering, computer science and other engineering, science and mathematics programs.

● **Strategy 3: Enhance use of technologies in teaching and learning** – The note and presentation explain how to enhance the use of online courses and integrate a range of digital tools, from the most basic to sophisticated, in teaching-learning across selected courses.

● **Strategy 4: Connect higher education and TVET institutions to affordable high-speed broadband** - The note and presentation explain how to increase high-speed broadband connectivity in research and educational networks at the national as well as higher education and TVET institution levels. It also covers how to improve development and management of campus networks and infrastructure.

● **Strategy 5: Capacity building and business process re-engineering in Ministries**- The note and presentation explain how ministry staff can be suitably qualified and how to redesign processes to become more efficient and digitally enabled. This covers staff and business processes in Ministries of Higher Education/TVET/Education and relevant national authorities (such as the Higher Education or TVET authorities).

Costing the Action Plan – The note and presentation provide a detailed explanation of the web-based tool (developed by GESCI) and how it can be used to determine detailed costing for the Action Plan.

Action Plan Templates for five strategies: These documents outline the layout and structure for the final Country Action Plan for each strategy. Once filled by the Country Planning Team, these templates can be consolidated together to form the Digital Skills Country Action Plan.

3
Overview of the Digital Skills Country Action Plan[1]

1 This refers to the higher education and TVET sectors

3.1 The Critical Importance of Digital Skills in Africa

African countries require digitally competent workforces and digitally literate citizens to reap the benefits promised by digital technologies. The preparation of a Digital Skills Country Action Plan aims to help countries to undertake strategic and targeted investments in developing the Digital Skill base of their populations, especially those groups exiting the education system and entering the workforce, where they will work for the next four to five decades.

Digital technologies have rapidly transformed the global economy and are expected to continue to do so with increasing speed, creating new industries in the process. They provide unprecedented opportunities to create new jobs, raise productivity and incomes and reduce poverty. An increasing number of existing jobs and almost all new jobs will require Digital Skills. A recent study by the IFC found that over 230 million jobs in Sub Saharan Africa will require Digital Skills by 2030, resulting in almost 650 million training opportunities.[2] African countries that fail to provide their populations with needed Digital Skills risk falling behind as the digital frontier races ahead, limiting their ability to catch up in the future and benefit from the digital revolution.

Many policymakers in Africa are actively responding to this rapidly emerging scenario and are increasingly recognizing the urgency of developing the Digital Skills in their population. The African Union Digital Transformation Strategy (2020-2030) and the Smart Africa initiative, among others, have included Digital Skills as one of the pillars for achieving an inclusive Digital Society and Economy in Africa.

Individual countries have also developed their own ICT policies and strategies, including education sector specific strategies. Yet, many of these policies and strategies lack a clear focus on Digital Skills and on the measures required to achieve them. Successful implementation of the strategies has also been limited because they have often not addressed operational issues and have not been costed or monitored.

Box 3.1 The Partnership for skills in Applied Sciences, Engineering and Technology

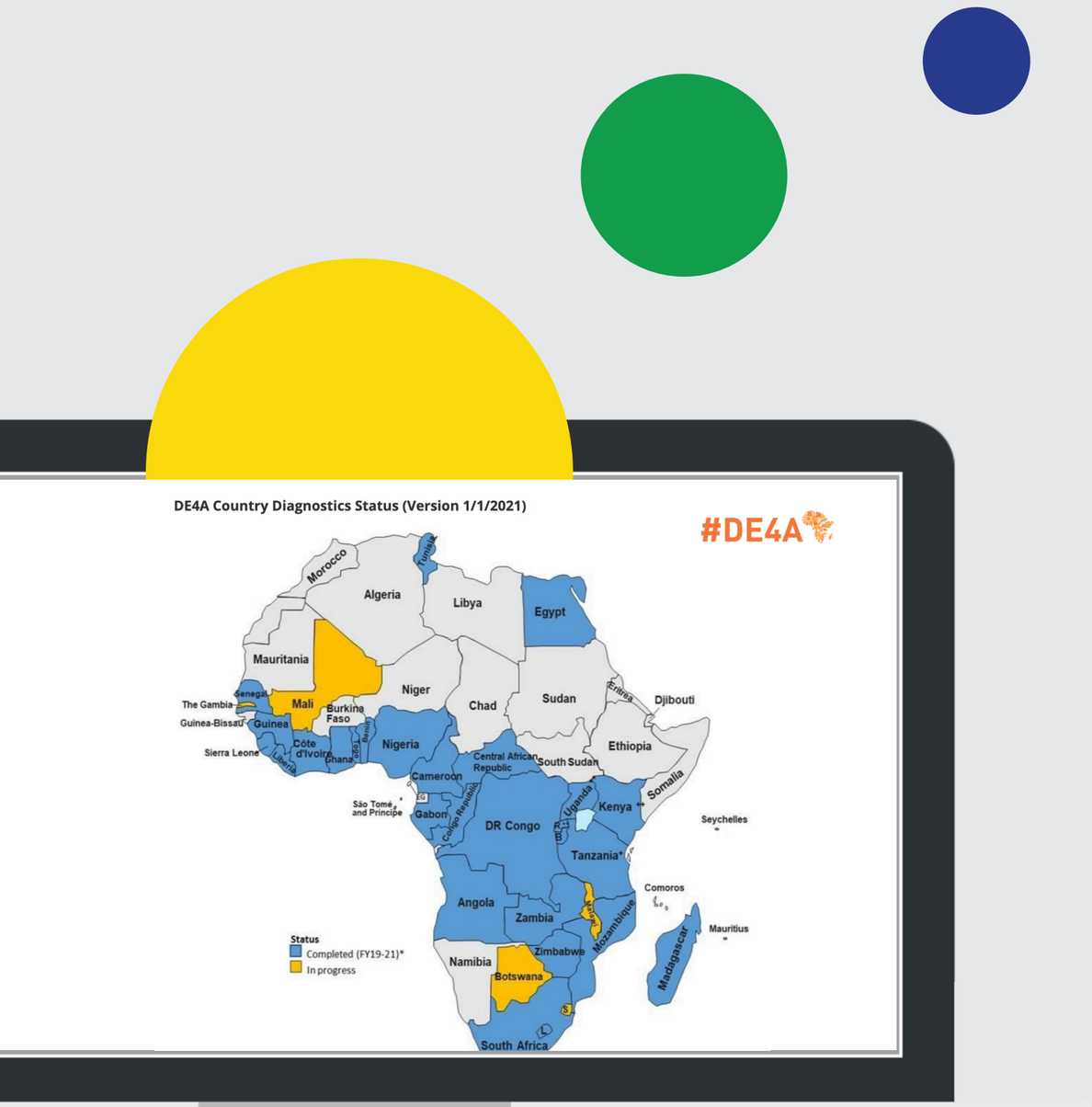
The Partnership for skills in Applied Sciences, Engineering and Technology (PASET), is a regional initiative led by African governments and facilitated by the World Bank. The partnership brings together African governments, local private sector, and donors to revitalize higher education (including research) and TVET institutions and programs, with a focus on developing excellence in science and technology competences for key sectors, thus driving transformation of the African continent.

PASET undertakes activities on three fronts in higher education and TVET: incubating and operationalizing regional initiatives, technical assistance and knowledge sharing. Key operational initiatives of PASET include the Regional Scholarship and Innovation Fund (RSIF) which is a pan-African Science Fund, seeded by African governments to raise the quality of Ph.D training and applied demand-driven research in competitively selected SSA universities through partnership with international universities; and the Regional Flagship TVET Institutes which are networked centers for training high quality technicians meeting international certification standards for regional infrastructure and regional integration projects. As part of its technical assistance, PASET launched a Regional Benchmarking of Universities which uses a standardized methodology and tool based on the adaptation of the international methodology to African contexts. To facilitate knowledge sharing, PASET also carries out focused study tours of government officials, private sector and institutions to Brazil, China, India, Japan, and Korea.

The Digital Skills Country Action Plan is part of the Technical Assistance provided by PASET.

3.2 PASET Forum on Digital Skills

An important milestone in highlighting the key relevance of Digital Skills in Africa was the 5th Forum of the Partnership for Skills in Applied Sciences, Engineering and Technology (PASET) held in Kigali, Rwanda from 20 to 23 May 2019 under the theme "Destination Digital Africa: Preparing our Youth for the Future" (further information available at https://www.worldbank.org/en/events/2019/04/22/5th-paset-forum). This forum was attended by high level representatives of 21 African countries, including 13 Ministers of Education/ Higher Education or Technical Vocational Education and Training (TVET). The Forum brought experiences from Asian countries, the private sector and educational institutions in ensuring internet connectivity for higher education and TVET institutions and secondary/post-secondary institutions, bringing about fundamental changes in course content and pedagogy and the use of technology to increase access, improve the delivery of educational content and engage in international research. Attending countries completed an initial background questionnaire, the results of which highlighted that most countries had broad ICT policies but lacked sufficiently detailed plans for higher education and TVET, as well as skills development for young people outside the formal education system. Attending countries also presented preliminary action plans for the development of Digital Skills in higher education and TVET institutions; these preliminary action plans covered critical policy reforms, reforming and improving the content of Digital Skills courses, improving the use of technology in higher education and TVET institutions, expanding internet connectivity and building the capacity of Ministries of Education/ Higher Education or TVET. The Forum also shared experiences from Korea and Singapore in preparing country level plans and strategies, comparisons of the quality and content of the engineering courses in Africa and other regions of the world and the revolutionary use of technology in teaching and learning. All 21 participating countries at the 5th PASET Forum committed to improving the stock of Digital Skills among their youth and adults by 2030 and expressed interest in further development of detailed costed Digital Skills Country Action Plans, that could help to prioritize investment and regulatory and policy changes.



3.3 The World Bank's Initiative on Digital Economy for Africa

The Digital Economy for Africa (DE4A) is a continent-wide initiative of the World Bank which aims to support African countries to build a robust and conducive environment for the digital economy. The DE4A covers five foundational pillars including Infrastructure, Digital Financial Services, Digital Platforms, Digital Entrepreneurship, and Digital Skills. Digital Skills are considered one of the five foundational pillars of DE4A as they enable the spread and adoption of digital technologies across many sectors, and because they can drive future innovations adapted to local African contexts. The World Bank has committed to investing US$25 billion into the DE4A initiative by 2030 and has started financing a number of country level and regional projects. To enable countries to benchmark themselves, the Bank also is also conducting "Digital Economy Country Diagnostics" in several countries which includes an analysis of the current state of Digital Skills.

Box 3.2 Digital Economy for Africa (DE4A)

The Digital Economy for Africa (DE4A) Initiative aims to ensure that 'every African individual, business, and government is digitally enabled by 2030'. The DE4A covers five foundational pillars including Digital Infrastructure, Digital Financial Services, Digital Public Platforms, Digital Businesses, and Digital Skills. The World Bank has committed to investing US$25 billion into the DE4A initiative by 2030 and has additionally started financing a number of country level and regional projects. To enable countries to benchmark themselves, the Bank has conducted "Digital Economy Country Diagnostic Assessments" in several countries which includes an analysis of the current state of Digital Skills. These diagnostics revealed that in most African countries the higher education system and TVET education system are not able to adequately prepare graduates to meet the demands of the fast-growing digital workspace. The Digital Skills Country Action Plan aims to address these gaps and contribute to the goals of the Digital Skills Pillar in the Digital Economy for Africa Initiative.

The Digital Skills Country Action Plan technical assistance is being provided under the auspices of PASET and is financed by the Digital Development Program Trust Fund managed by the World Bank.

For further information on the DE4A, visit https://www.worldbank.org/en/programs/all-africa-digital-transformation.

3.4 Why Should a Country Prepare a Digital Skills Country Action Plan?

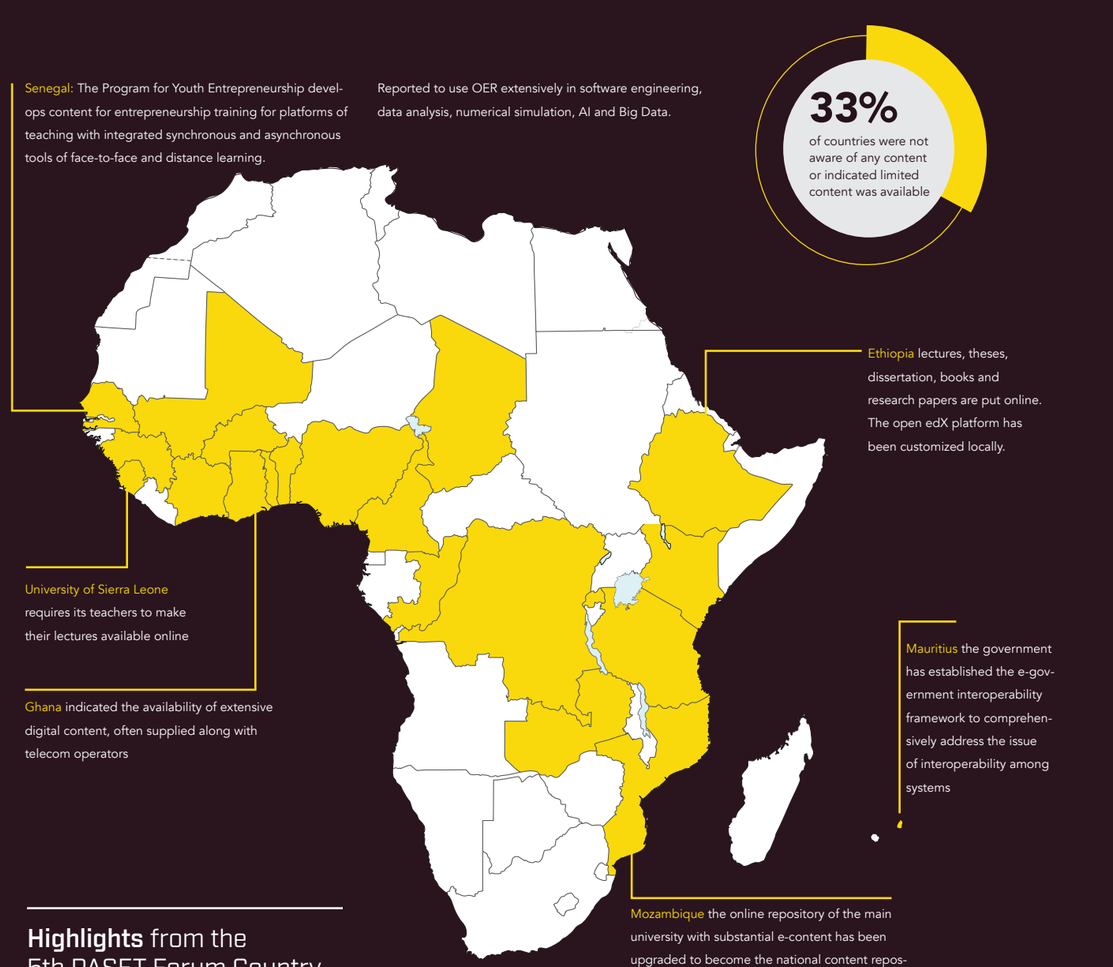
Many African countries have master plans for Information and Communication Technology (ICT) including a specific focus on ICT for education, but many of these strategies lack operational details and do not provide enough information to guide policy development and investments. They also do not focus on Digital Skills as the principal desired outcome and do not identify interventions that are required to reach those outcomes. In practice many countries, faced with resource constraints and lack of operational plans, have implemented uncoordinated initiatives such as the provision of devices or connectivity, without paying attention to the reform of courses, training of faculty, technical support for use of technology, etc. As a result, many of these initiatives have led to sub-optimal outcomes. For a country to harness the digital revolution at scale will require systemic change, coordinated action from a broad spectrum of actors, human resources, investments in infrastructure, multiple sources of funding and other actions. Based on the results from questionnaires at the 5th PASET Forum and the Digital Economy Country Diagnostic Assessments, it is apparent that even countries with ICT strategies relating to education lack clarity on the kinds of Digital Skills required and how to advance the use of digital technology.

Box 3.4 Findings from the 5th PASET Forum Country Survey

21 African countries participated in the 5th PASET Forum organized in Kigali, Rwanda in May 2019. Prior to the Forum, Ministries of Higher Education/TVET/Education completed a survey to assess their country's preparedness for the 4th Industrial revolution and the digital economy. Responses to questions related to the development of Digital Skills and use of technology in higher education and TVET are summarized here. The Country Survey questionnaires provide valuable background information for the Digital Skills Country Action Plan.

Digital Skills Requirements: In response to a question on the kinds of new jobs and skills requirements that are likely to emerge, respondents tended to emphasize "data scientists", "engineers", "cybersecurity experts" "developers of applications" – that is to say, higher levels of Digital Skills rather than the skills that would be required in a variety of occupations. No country cited labor market studies or assessment of demand.

Local digital content in higher education relates mostly to putting up existing course content and lectures by professors; there is very limited content at the TVET level. Of the 21 countries, 7 country responses indicated that either they were not aware of any content or there was very limited content. Amongst the other respondents, the bulk of local content comprises putting up lectures and related materials on university websites, often as a result of institutional directives. For instance, the University of Sierra Leone requires its teachers to make their lectures available online. The University of Kinshasa makes their courses available online through opensource Learning Management Systems (LMS) such as Moodle and Claroline. In Mozambique, the online repository of the main university with substantial e-content has been upgraded to become the national content repository. In Ethiopia,



Senegal reported using OER extensively in software engineering, data analysis, numerical simulation, AI and Big Data. lectures, theses, dissertation, books and research papers are put online. Ghana indicated the availability of extensive digital content, often supplied along with telecom operators.

Virtual or distance education universities are gradually developing more content. The Virtual University of Senegal (UVS) develops its content locally, using local universities and Orange (telecom operator) integrates the UVS into its e-learning offer. The Program for Youth Entrepreneurship in Senegal develops content for entrepreneurship training for platforms of teaching with integrated synchronous and asynchronous tools of face-to-face and distance learning. In Guinea, the Higher Institute of Distance Learning is creating online courses in a number of curricular areas.

Use of proprietary software presents major problems and the high cost of subscription prevents extensive use and encourages use of pirated software. More than half of the surveyed countries reported issues. The principal issues are: the high costs of subscription, particularly for sophisticated software (for image processing, multimedia

objects, design software etc.), which are prohibitive given the size of the ICT budgets, the renewal of licenses and copyright. This prevents the extensive use of technology in teaching. The high cost of acquisition has also caused the rampant spread of pirated software, leading to greater vulnerability to cybersecurity risks. On the demand side, there Is resistance amongst faculty to use digital tools in teaching, especially given lack of training and technical support.

Open Education Resources (OERs) are reported to be used by three-quarters of the countries, but few countries appear to use them extensively. In Ethiopia, the open edX platform has been customized locally. The Mozambique NREN has classified and made OERs available on its site, with links to other sites and to Massive Open Online courses (MOOCs). Senegal reported using OER extensively in software engineering, data analysis, numerical simulation, AI and Big Data. In Sierra Leone, teachers in teacher training colleges are being trained to prepare teaching materials using OER and develop Sierra Leone Open Educational Resources (SLOER).

Interoperability of systems is still an important bottleneck, but some countries have clear frameworks. While half the countries have clear guidelines for interoperability of systems at educational institutions, the other half are unaware of how to deal with interoperability issues. Mauritius is advanced in this regard, as the government has established the e-government interoperability framework to comprehensively address the issue of interoperability among systems (http://cib.govmu.org/english/documents/downloads/egif.pdf). The Information Highway platform provides electronic data interoperability and sharing platform (ih.govmu.org). For the e-learning and online components, eLearning specialists are trained in eLearning metadata standards and the platform complies with industry standards such as SCORM (Shareable Content Object Reference Model). Mozambique has approved the eGovernment Interoperability Framework that has the architecture and technical standards for the development of eGovernment applications and services.

Procurement of educational technology poses enormous challenges in almost all countries. The principal issues mentioned were: the lack of technical knowledge amongst decision makers, limited knowledge of technology options (particularly amongst faculty), limitations on technology choices imposed by lack of connectivity and/or the skills and knowledge of faculty, local companies not offering the latest version of ICT equipment and software, difficulties in assessing total cost, lack of information on interoperability, lack of local skills to maintain equipment, slow and cumbersome procurement processes which are not appropriate in choosing the best technology. Procurement Is guided mostly by the Public Procurement Act or Public Procurement Regulatory Authority.

Guidance and support for technology use is still nascent and at the institution level is mainly focused on management of digital infrastructure, rather than on its use for education. At the national level, most countries have laws and regulations that provide general guidance to educational institutions on standards and cybersecurity. All countries surveyed have ICT officers/ICT directorates for their public higher education institutions, but rarely in TVET institutions. It appears that these units deal mainly with network connection and management or equipment, but are not closely linked with the faculty and the use of technology in curriculum design, training and so on. Several universities have well developed ICT policies and master plans (for example, the University of Rwanda). The Mozambique NREN (MoREN) has guidelines for all higher education and TVET Institutions, including the storage of data and use of national government data centers. In Senegal, the government has encouraged the development of ICT plans in universities through performance-based contracts.

Lack of understanding about the different types of digital skills, which are increasingly required across many professions, has also impeded progress. Access to digital devices, often just an internet-enabled mobile device in the African context, is often considered sufficient to acquire foundational digital skills. Having access to a device is indeed an essential pre-condition for any kind of digital skill, but using it does not automatically confer the competences listed in the digital literacy frameworks outlined above. The kind of digital skills required for a digital economy need to be acquired through education and training, both formal and informal. The quality and appropriateness of digital skills programs matter. In turn, delivering such programs require coordinated strategies.

While this guidebook emphasizes the core strategies that need to be addressed in every country, the Digital Skills Country Action Plan is intended to be country specific, linked to the specific needs and current situation of the country. Analysis of the demand for digital skills of different types, the current state of supply, the objectives and targets that the country wishes to set itself, the availability of resources and the feasibility of implementation of different strategies (including available human resource and organizational capabilities) – all these will determine the specifics of the Digital Skills Country Action Plan for each country. The Guidebook outlines baseline information that should be collected for each country and scenario planning approaches that allow each country to set ambitious but realistic approaches.

The World Bank's DE4A country diagnostics provide a wealth of information on African countries and should be consulted as part of the Digital Skills Country Action Plan. Using a common diagnostic tool allows countries to get information on the five pillars, the country diagnostics provide information on the five pillars of the DE4A as well as cross-cutting areas. The assessment of the Digital Skills pillar in the country diagnostics is aligned with the concepts and frameworks used in this guidebook.

Box 3.5 Digital Economy Diagnostics at Country Level

To enable countries to benchmark themselves, the World Bank has conducted "Digital Economy Country Diagnostic Assessments" in several countries which includes an analysis of the current state of Digital Skills.

The DE4A diagnostic tool provides an integrated framework for assessing the enabling environment and level of development of digital economy in a country in Africa. The objective of the diagnostic is to determine the current state of play of digital economy in the country and assess key levers that drive the country's digital economy. The findings of the diagnostic are intended to provide practical, actionable recommendations to governments and stakeholders on priority areas of development, with a mix of possible policy reforms and financing needs.

The diagnostic tool focuses on the five pillars of the digital economy: digital infrastructure, digital public platforms, digital finance, digital businesses and digital skills. For a vibrant, inclusive and safe digital economy, African countries would require building key foundational elements of a digital economy. The foundations of digital economy also involve several cross-cutting areas, including digital economy/agile regulation, competition policy, gender, cybersecurity, consumer protection and data protection.

The diagnostic of the digital skills pillar focuses on assessing the demand and supply of digital skills (both digital literacy skills for citizens and for general occupations as well as digital skills for the ICT professions). As in most cases, assessments of digital skills are not available, it suggests how proxies can be used to estimate demand and supply. In relation to the supply, it assesses both formal education and training programs as well non-formal training programs, using the frameworks outlined here to determine what types of digital skills are provided. The diagnostic is not restricted to higher education and TVET.

The diagnostic of the other pillars will also provide valuable inputs for preparing the strategies of the Digital Skills Country Action Plan, for instance on the state of digital infrastructure and the regulatory environment. However, the Digital Skills Country Action Plan will require further data specific to the education and training sector, such as on broadband connectivity and on policies, to develop coordinated strategies as outlined in this Guidebook.The diagnostic on the state of digital public platforms, digital finance and digital businesses also provide information on whether digital skills are a constraint to the development of these foundations. Most of the country diagnostics done to date highlight that the absence of digital skills, both foundational digital literacy, as well as advanced digital skills for the ICT professions, act as a brake on the digital economy. This highlights the urgency of developing Digital Skills Country Action Plans.

The diagnostic tool and published country reports are available here:

https://www.worldbank.org/en/topic/digitaldevelopment/brief/digital-economy-country-diagnostics-for-africa

3.5 What are "Digital Skills"?

Digital competence is often understood in simplistic terms, for instance, the ability to use a mobile phone for simple transactions or access and surf the internet; or, at the other end, to undertake coding and software programming. The concept of digital literacy is deeper and broader, encompassing several competences to access, use, manage and create digital information and digital tools. Individuals may differ in their level of proficiency in these different competences. At the higher end of the digital skills continuum, individuals will have the ability to deploy digital technologies, to develop new applications and come up with solutions to new problems.

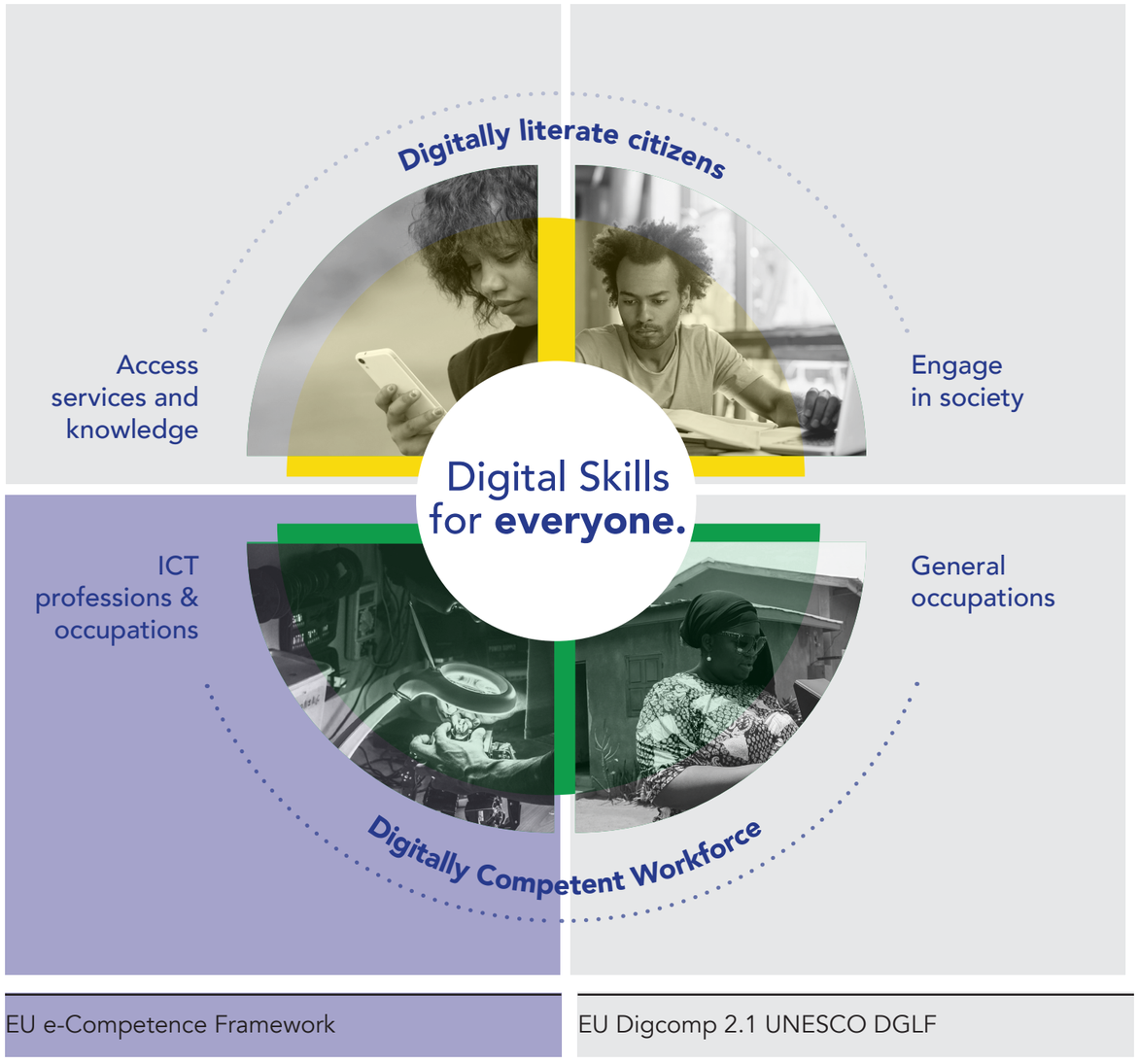
An increasing number of occupations and sectors require workers with a range of Digital Skills, without being ICT specialists or technicians. Broad-based digital literacy skills at various levels of proficiency are required for the uptake of digital technologies across sectors, while advanced digital literacy skills are required to drive adoption of digital technologies as well as innovation. In addition, those working in ICT professions (from technician level to specialized hardware and software engineers and programmers) require specialized knowledge related to these professions. Due to increasing opportunities for lifelong learning, as well as online learning, those who have not been trained for the ICT professions can acquire additional specialized competences. Nevertheless, these competences require specialized training which is different from the general digital literacy skills. Both sets of skills are required for the digital economy.

Definitions of "Digital Skills levels" vary across different countries and in various reports. While it is appropriate for each country to develop context specific definitions, it is appropriate to benchmark them to some international frameworks, so as to enable meaningful comparisons. Broadly speaking, the digital skills for citizens and the general workforce and digital skills for the ICT professions involve different domains and competences and require different frameworks which specify the relevant competences and proficiency levels.

In this Guidebook, the competences and proficiency levels used in the European Union's Digital Competence Framework (EU DigComp 2.1) and further developed in UNESCO's Digital Global Literacy Framework (DGLF) are used to describe four levels of Digital Skills: basic, intermediate, advanced and highly specialized. These frameworks help to understand Digital Skills requirements across a range of occupations in many sectors and for citizens at large living in a digital society. For those who will be directly employed in ICT professions, the European Union's e-Competency framework provides a benchmark. Figure 3-1 summarizes the different types of digital skills and the suggested frameworks.

Section 6.1.2 of this Guidebook and detailed note on ● Strategy 1 (Part 2 of Guidebook) provide more details on these frameworks. This Guidebook recommends that these frameworks need to be adapted to African country contexts. Nevertheless, in order to facilitate understanding of the different Digital Skills levels, the definitions corresponding to the EU/UNESCO frameworks and the EU's e-Competency frameworks (for ICT professionals) are briefly described in Box 3-3 and presented in Figures 6-2 and 6-3. As shown in Figure 6-2, a greater proportion of the workforce (ideally 100 percent) should have foundational digital skills, while smaller proportions will have higher levels of proficiency, depending on the country's requirements.

Figure 3.1: Digital Skills: A Typology



Box 3.3 Digital Skills – Competences and Proficiency Levels

The UNESCO Digital Literacy Global Framework (DLGF), which builds on the EU DigComp 2.1 framework, covers the following **7 competences**: Fundamentals of hardware and software, Information and data literacy, Communication and collaboration, Digital content creation, Safety, Problem solving and Career-related competences. Using this framework, which applies to a wide range of occupations in which Digital Skills can be used, **the levels of Digital Skills** are indicated by the following proficiency characteristics:

- *Basic/Foundational:* deals with simple tasks that involve remembering content and instructions but also requires some guidance to execute.
- *Intermediate:* deals independently with well-defined, routine and non-routine problems that involve understanding content.
- *Advanced:* deals with and provide guidance to others on different tasks and problems that involve applying and evaluating content in complex situations
- *Highly specialized:* resolves complex problems with few or several moving pieces, guides others, contributes to professional practice and proposes new ideas to the field.

The EU's e-Competency framework is related to Digital Skills required in the ICT professions. It delineates **5 e-competence areas** derived from ICT business processes: PLAN – BUILD – RUN – ENABLE – MANAGE. There are **5 proficiency levels**, which roughly correspond to different levels of occupational responsibility and complexity as well as education and training. For instance, Levels 1-2 broadly correspond to those who have upper secondary/TVET level of training. Level 3 corresponds to engineers/computer scientists/mathematicians etc. with undergraduate degrees and levels 4 and 5 to those with post-graduate education in the same fields.

3.6 The Focus on Higher Education and TVET

This Guidebook and the Digital Skills Country Action Plan focuses on higher education and TVET for a number of reasons.

The higher education and TVET systems are set to expand as more young people complete secondary school over the next ten years. Ensuring that the quality of Digital Skills training in these institutions is expanded and improved can have an immediate impact on the employability of graduates by adding critical competencies that employers require. Recent estimates of demand for digital skills in sub-Saharan Africa also indicate that shortages in intermediate level Digital Skills (corresponding to TVET/undergraduate level of education training) are large; the demand for advanced and highly specialized Digital Skills is expected to grow, especially in countries which have high rates of growth and which are diversifying[3]. A third reason is that by focusing attention and resources on a relatively small number of institutions (compared to primary and secondary schools), the impacts can be immediate and visible. The introduction of digital skills in higher education and TVET can also impact the school system in two ways: by generating the demand for acquiring basic and intermediate level Digital Skills amongst school students, and also by preparing new (pre-service) primary and secondary school teachers, who are trained in higher education, with digital competences.

Digital Skills Country Action Plans are designed to help higher education and TVET institutions in Africa develop operational institution-level plans. Many higher education institutions have ICT strategies which are sometimes still in draft stage or are not updated regularly, and in most cases, are not implemented at scale while the majority of TVET institutions do not have comprehensive Digital Skills policies or strategies.

3.7 Necessity for a Coordinated Approach: Five Critical Strategies for Developing Digital Skills

First generation "ICT in education" projects and programs were largely uncoordinated efforts, focusing on single initiatives (such as connecting institutions to the internet, or supplying devices to students), without adequate support for digital content, teacher/faculty development, within-institution connectivity to allow universal access or regular technical support and troubleshooting. This led to instances of sub-optimal investment and inadequate results in the acquisition of Digital Skills. Now that digital technologies have now evolved to the stage of enabling deep integration of digital tools in teaching and learning, implementation requires coordinated action on several fronts.

This Guidebook proposes five broad coordinated strategies, which are considered essential for developing Digital Skills. Section 6 and Part 2 of this guidebook provides more details on each of these strategies.

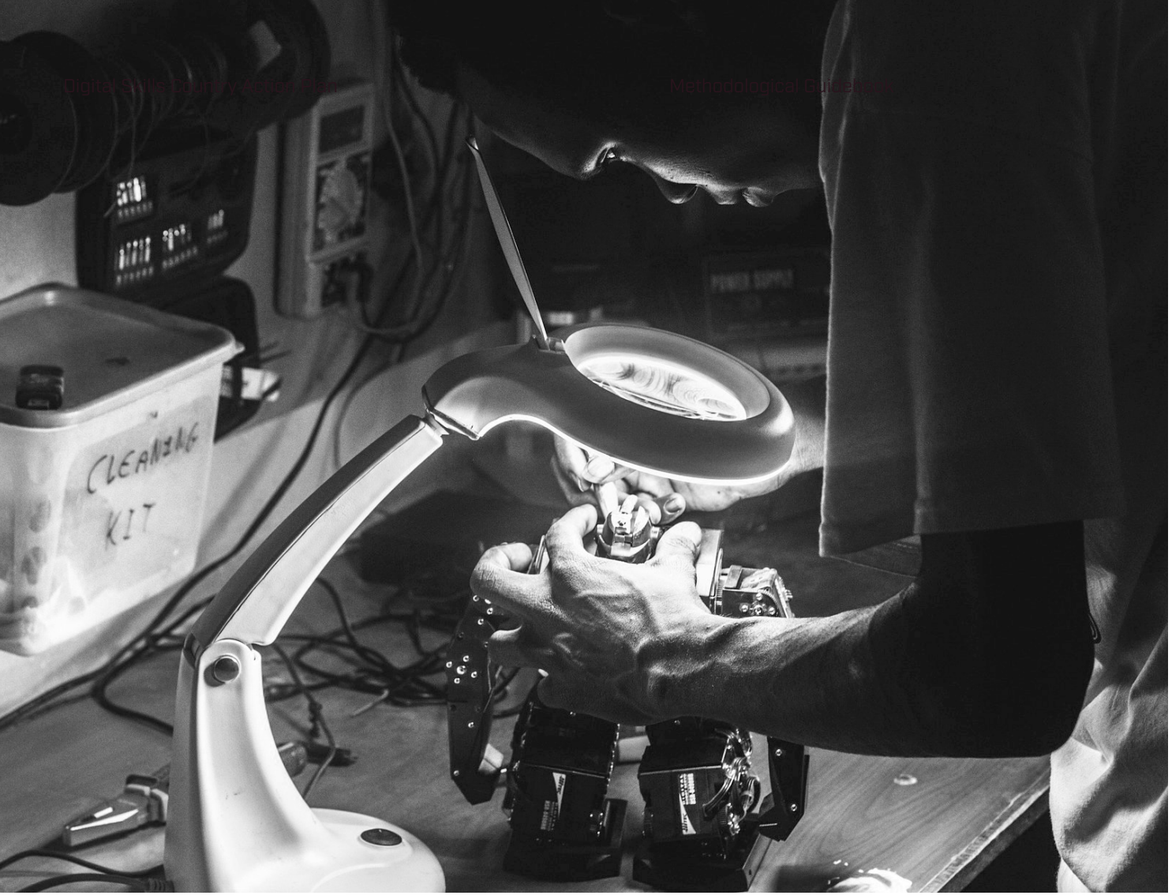
The five main strategies proposed in this guidebook are the following:

- ● Strategy 1: Establish enabling policies and develop Digital Skills framework
- ● Strategy 2: Reform of Digital Skills programs
- ● Strategy 3: Enhance use of technologies in teaching and learning
- ● Strategy 4: Connect higher education and TVET institutions to affordable high-speed broadband
- ● Strategy 5: Capacity building and business process re-engineering in Ministries

3.7.1 Rationale and Risks of a Coordinated Approach

The rationale for considering these strategies together is that a coordinated approach is required if higher education and TVET institutions are to help develop Digital Skills amongst young people. Each of the five strategies is interrelated and it is useful to understand how they are interlinked and reinforce each other. To achieve the overall outcomes of the Digital Skills Country Action Plan, it is recommended that countries pursue each of the strategies in parallel, even though the relative emphasis and priorities may vary depending on country context and goals.

For instance, consider the case of a government which wishes to ensure that 50 percent of students enrolled in higher education and TVET institutions would acquire at least intermediate level Digital Skills by 2025. (The issue of how to arrive at ambitious, yet realistic, goals and targets is considered in Section 5). To do this, it would have to adopt a Digital Skills Framework (part of ● Strategy 1) that defines the various competences and levels of proficiency, which is used by education and training providers and understood/accepted by employers. The country would also have to encourage or incentivize education and training institutions to reform their Digital Skills programs or introduce new ones (● Strategy 2) and ensure that they offer Digital Skills training to at least 50 percent of enrolled students. These education and training programs should correspond to skills needs required by current employers and projected skills needs over the medium term. Reform of Digital Skills programs involves changes to curricula, teaching methods and assessment, requiring investments in curriculum development, faculty training, equipment and infrastructure. To give students hands on experience, these programs should also incorporate digital technologies and tools in teaching and learning (● Strategy 3); involving careful selection of tools, investments in faculty training and easily accessible technical support. An essential condition for enabling the extensive use of digital technologies and tools in education is affordable, high-speed broadband connectivity for higher education and TVET institutions, which includes connecting to the national network but also developing adequate campus networks and infrastructure to allow use of technology, and



maintenance and management of the network (● Strategy 4). All the above requires an upgrading of the current capacity of the Ministries overseeing higher education and TVET for policy development and implementation, increasing familiarity with technology choices and issues, reforming key business processes such as staff hiring, procurement of technology and monitoring (● Strategy 5).

A coordinated approach is likely to yield better results but it also imposes greater costs in terms of higher levels of organization and multiple types of capacities. Hence, countries should make a rapid assessment of digital skills needs, set ambitious but realistic goals and prioritize the activities under each strategy so that the plan can be implemented.

3.7.2 Private Sector Participation in Delivering the Strategies

The participation of the private sector is critical in the success of the Digital Skills Action Plan but is not treated separately as it will be considered in each of the individual strategies. The private sector is important both as the employer (hence, influencing the demand for Digital Skills which must be considered as a priority) and as provider of Digital Skills training. The design of the Digital Skills framework and of Digital Skills programs requires the involvement of the private sector to ensure relevance and quality. Private education and training institutions form a significant part of provision in higher education and training and private providers can also participate in online training provision and rapid skilling programs in public institutions. Enabling the private sector to participate requires the design of appropriate policies and regulatory frameworks, options that the planning team should consider during design of the Digital Skills Country Action Plan.

3.7.3 The Regional Dimension

Although each country will prepare its specific Digital Skills Country Action Plan, it should also consider the continent wide and regional policies, frameworks and initiatives and how that they are likely to impact demand for digital skills as well as to facilitate the five strategies. The African Union has adopted the Digital Transformation Strategy which provides an overarching framework, although implementation remains at the country level. There are ongoing initiatives to create sub-regional Single Digital Markets, such as East Africa, which aim to promote a single market for connectivity, data and online transactions. Such initiatives could potentially lower prices and improve quality of broadband, attract investment in data infrastructure and allow seamless transfer of data and information between countries. Such initiatives can significantly expand the demand for digital skills at all levels, going beyond current domestic demand. The implication of these policies and initiatives for the Digital Skills Country Action Plan for higher education and TVET should be examined.

Further, broadband connectivity requires linkages with other countries in the region. In Africa, the National Research and Education Networks (NRENs) are already linked to sub-regional RENs and the Digital Skills Country Action Plan could examine how these links could be strengthened or leveraged. There are also economies of scale in taking a regional approach to using certain tools such as Learning Management Systems (due to the high cost of adaptation), or developing content for language groups that span different countries. A final important area for regional cooperation is in the training of highly specialized professionals (AI engineers, data scientists etc.), which is expensive and infeasible to do at the country level, for most small countries.

3.7.4 Planning Time Horizon

The Guidebook proposes using a five-year planning horizon for detailed implementation in the Digital Skills Country Action Plan but a roadmap for Digital Skills development for ten years is required because, in practice, many of the activities under critical strategies (for instance reform of Digital Skills programs or introduction of new programs) will take 1-2 years to be launched, leaving only a few years for implementation.

Detailed planning beyond a five-year period is not advised for a number of reasons. First, technologies and costs are rapidly changing in the digital world. With the advent of 5G, for instance, many new possibilities open up. New technologies may enable connectivity in remote areas at a fraction of current costs. Second, the demand for Digital Skills in a country may change rapidly due to economic as well as technological factors. Third, the planning process itself involves costs.

It is critical is to have a process for monitoring and regularly updating the Digital Skills Action Plan, including all the assumptions underlying it.

3.8 Modalities for Implementation at the Institution Level and Supporting National Level Actions

While the Digital Skills Country Action Plan is prepared at the national level, implementation of many of the strategies and activities will be at the institution level. Certain strategies, such as the development of policies and Digital Skills frameworks, or the roll out of the national broadband network for higher education and TVET institutions, need to be implemented at the national level. Reforms of Digital Skills programs, introduction of new courses of study, and the extent to which technology is incorporated in teaching-learning, on the other hand, have to be implemented at the institution level. Nevertheless, the Digital Skills Country Action Plan, by laying out priorities and targets, is likely to shape the behavior of institutions, especially through the use of incremental funding to achieve the targets.

All higher education institutions and, in some countries, TVET institutions enjoy a large degree of autonomy so enlisting their participation in implementation is a crucial issue. One method is to involve the leaders in the planning and consultation process. However, another important modality is through the use of public financing tools such as performance-based funding, results-based funding etc. to create the incentives and accountability for introducing changes.

This Guidebook does not address these financing instruments or changes to the incentive structures as often they are designed together with external partners. It is nevertheless advisable for the country planning team to consider how funding can be used to incentivize implementation of the Plan's priorities at the institution level. While the total number of institutions to be funded can be indicated in the Plan (based on resource availability and implementation capacity), the selection of universities and TVET institutions can be done competitively, through the preparation of institution level implementation plans and their evaluation based on transparent criteria.

A number of supporting actions need to be carried out at the national level in order to ensure that institutions can implement the strategies effectively. For instance, the reform of digital skills programs and their frequent updating require greater agility in the process of approving curriculum changes and of new courses. Changing faculty incentives at the national level to favor the adaption of technology or creation of content may also be needed.

3.9 Country Planning Team and Stakeholder Consultation

Preparing a Digital Skills Country Action Plan is an important endeavor and it requires adequate human resources and time. It also involves working with multiple Ministries (in particular, the Ministry of Higher Education/TVET and the Ministry of ICT or relevant agencies should be involved), agencies, institutions and the private sector. It therefore requires high level leadership and monitoring to make the process successful.

Working Groups focused on each strategic area plus one on costing and resource mobilization should be organized. Working Groups should comprise not only Ministry personnel but must include people with adequate technical knowledge and expertise in the particular domain area, including those (with experience) from the private sector. Private sector and civil society should have a voice in the process, especially for demand forecasting. A high-level Country Planning Team should be constituted, comprising the coordinators of the Working Groups and other leading personnel. This team should report to the Minister or relevant decision-making authority which will make final approvals on the Digital Skills Country Action Plan.

It is also important to hold consultations with key stakeholders throughout the process including employers of different types; the leaders of academic institutions and heads of relevant departments; faculty and students; private training providers; the National Research and Education Networks; telecommunications providers; the regulatory agencies in higher education and TVET.

Many countries will have existing plans, strategies or resources that can be used (or adopted) in the development of Digital Skills Country Action Plans. As far as possible, existing resources should be used (or adopted) as part of new plan development.

7

STEPS TO PREPARE A DIGITAL SKILLS COUNTRY ACTION PLAN

1 Assess employer needs
for Digital Skills at various levels – now and projections over five years and ten years (demand forecasting)

2 Document the baseline state
of Digital Skills training in higher education and TVET.

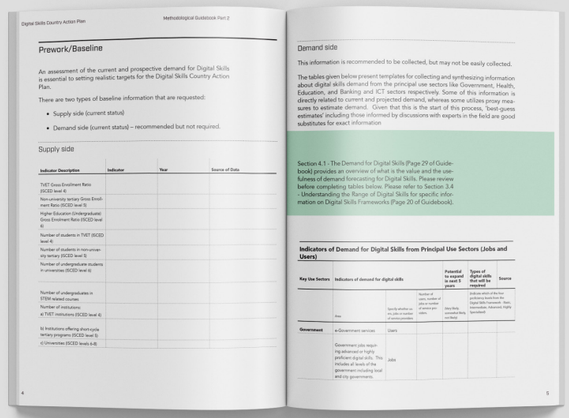
3 Conduct a rapid assessment
of baseline status of key indicators for each of the five strategies

4 Conduct a first iteration
with three "levels of ambition" for the goals of the DSCAP, to yield estimates of costs, infrastructure requirements and HR needs.

5 Make decisions
regarding the "level of ambition" to set ambitious and realistic goals for the DSCAP and a planned scale of implementation

6 Start planning details
of each of the strategies, with activities, targets and costs

7 Prepare the DSCAP
adapting the template, with goals, strategies, and activities, monitoring indicators, implementation and costs.



3.10 Characteristics of a High-Quality Action Plan

While each Digital Skills Country Action Plan will be unique to each country, reflecting its current context and its goals, there are certain common features of a high-quality plan, which are described in Box 3-6.

Baseline indicators for the Digital Skills Country Action Plan should be developed. The prior work on data collection, which is indicated later, and also in the Appendix can provide information for these indicators. Baseline indicators for outcomes (i.e., the digital skills of students) and for key outputs and inputs/ activities are provided below.

The overall outcome/output indicators for the Digital Skills Country Action Plan could be

- % of the student population (target group to be defined) with at least intermediate level general digital skills
- Number of students graduating from computer science and electrical engineering courses of benchmarked quality

As data on the assessment of digital skills is unlikely to be available, the first digital skills assessment conducted during implementation of the plan should provide appropriate baseline for future monitoring.

Detailed indicators for each strategy and how they will be measured should be defined in the Digital Skills Country Action Plan. Some suggested indicators and their reporting units are provided in Table 3.1.

Box 3.6 Characteristics of a Digital Skills Country Action Plan

A good Digital Skills Country Action Plan should have the following features:

- Include a description of the different types of Digital Skills for different occupations and provide an assessment of the demand and current supply through formal education and training institutions and private providers, NGOs etc
- Provide key baseline indicators for the Plan which can be used to monitor progress
- Detail clear targets over the implementation period. Each target should be set based on realistic skills needs and resources assessments.
- Each strategy should include the clear implementing steps or activities to be undertaken within a clearly defined timeframe
- For each activity, a good Action Plan should specify the responsible parties for executing the actions, the resources required (human and technological) and the costing of the activity.

Table 3.1 Suggested Indicators & Reporting Units

	Area	Indicator	Reporting Units
Strategy 1	Policy	Interoperability Policy for Higher Education and TVETS	Completion of the Stages for Policy Reform 1) Review, 2) Development, 3) Approval, 4) Institution
		National Universal Access Fund Policy	Completion of the Stages for Policy Reform 1) Review, 2) Development, 3) Approval, 4) Institution
		National Digital Skills Framework	Completion of the Stages for Policy Reform 1) Review, 2) Development, 3) Approval, 4) Institution
		Intellectual Property Rights Policy	Completion of the Stages for Policy Reform 1) Review, 2) Development, 3) Approval, 4) Institution
Strategy 2	Digital skills for all professions	Institutions offering general digital skills programs (benchmarked to a framework) for all students	# Number + % Percentage of institutions (broken down by higher education/TVET)
	Digital skills for all ICT professions	Courses for ICT professions that have been upgraded according to international benchmarks	# Number + % Percentage of courses (broken down by higher education/TVET)
Strategy 3	Course Creation	Courses created offering intermediate digital skills instruction and practice	Number of courses per campus
	Enrollment	Enrollment in intermediate level digital skills courses	# Number + % Percentage of Total Per Campus
	Training	Faculty demonstrating intermediate digital skill integration in courses	# Number + % Percentage of Total Per Campus
Strategy 4	NREN	NREN connected HEIs	Completed # Number + % Percentage of HEIs Total HEIs in the country.
		NREN Bandwidth Subscription	Total Gbps, + % of total consumption, + % of need 1mbps/student after the upgrade.
	CaNDiS	Campuses Upgraded	Completion of # Number of Campuses with at least 0.25 Gbps* link capacity + Percentage of Total
		Campus Bandwidth consumption (GB)	Total Gbps, + % of total consumption, + % of need 1mbps/student after the upgrade.
Strategy 5	People and Processes	Structured Training Programme for Digital Leaders	Completion of the Stages for Programme Development 1) Review, 2) Development, 3) Approval, 4) Institution
		Shorter Course Approval Process on Digital Skills for Higher Ed and TVETs	Completion of the Stages for Process Reengineering 1) Review, 2) Development, 3) Approval, 4) Institution
		Responsive Procurement Process for Small Value Purchase	Completion of the Stages for Policy Reengineering 1) Review, 2) Development, 3) Approval, 4) Institution

4 Digital Skills: Assessing Demand, Provision and Current Level Amongst Students

4.1 The Demand for Digital Skills

An increasing number of occupations will require Digital Skills at various levels of proficiency. These occupations will not only be in the traditional "ICT sectors" but also a number of other industries, as digital technologies become more prevalent. These technologies are also penetrating the informal sector, creating the need for Digital Skills in agriculture, retail trade, construction, logistics, transport (auto-repair) and small-scale manufacturing (metal fabrication).

An assessment of the current and prospective demand for Digital Skills in a country is essential to setting realistic targets for the Digital Skills Country Action Plan. Demand will come from the public and private sector, both formal and informal. There are various mechanisms by which this could be done: a regular roundtable meeting between employers and relevant government authorities; sector-specific skills needs assessments; a survey of job advertisements on LinkedIn and other job portals etc. Many countries carry out frequent labor force surveys which, if well designed, could be a useful source of information for this purpose.

It can be quite challenging and demanding to conduct an in-depth assessment of the demand for Digital Skills in African countries, as the World Bank's Country Diagnostics on the Digital Economy have shown. The data is often incomplete or outdated, or simply doesn't exist. Nevertheless, some of these World Bank reports have valuable information on the demand for Digital Skills that should be exploited. Data from LinkedIn or other job platforms can provide insights into the occupations that are in demand. However, there are inherent biases as these platforms tend to serve the formal sector workers. Another possibility is to do special surveys to gauge current and future demand. Box 4-1 provides information on findings from one such study, which included sub-Saharan Africa, with a spotlight on Ghana.

Box 4.1 Digital Skills in sub-Saharan Africa: Spotlight on Ghana – Findings from an IFC report[1]

Extracts from the report

"Study researchers undertook a global Digital Skills survey in October and November 2018. More than 60 percent of the respondents were African, of whom 50 percent were Ghanaian. The survey sought to understand the trends in Digital Skills in Sub-Saharan Africa, broader emerging markets, and developed markets.

The survey found basic Digital Skills such as email communication, web research, and online transactions are viewed as essential to the future workforce, but some intermediate and advanced skills such as data analytics, artificial intelligence/ machine learning, and digital marketing were perceived among the top required skills across countries. Basic Digital Skills dominate these findings precisely because they are foundational, but it is noteworthy that some intermediate and advanced skills are now considered essential to future economies.

The top two Digital Skills cited across all markets are computer literacy (ability to use a computer or smartphone) and email communication, both of which are basic skills. Survey respondents weighed data analytics, an intermediate skill, as the third most important digital skill for future job markets.

Respondents believe that, in Sub-Saharan Africa, the largest supply-demand gap is in intermediate Digital Skills…however, Ghana is expected to have a larger supply gap for advanced Digital Skills than for intermediate skills.

The labor market for Digital Skills in Sub-Saharan Africa, particularly Ghana, is already highly developed. Survey respondents identified the percentage of jobs in their organizations that would require at least the level of skills indicated—basic, intermediate, or advanced...roughly 60 percent of all new digital hires, regardless of geography, need basic skills. Some 30 percent require intermediate skills in Sub-Saharan Africa, while 35 percent in Ghana and 37 percent in global markets require them, according to survey respondents….Ghana requires 22 percent of new hires to have advanced skills.

As economies in the region become digitally advanced, the share of employees needing more advanced Digital Skills will likely increase. The digital needs of Ghana's economy have progressed at a faster pace than those in the rest of the region, with a greater proportion of new hires requiring intermediate and advanced skills.

The survey also sought to understand how demand for Digital Skills is likely to increase. In line with global markets, Sub-Saharan Africa and Ghana are expected to see a strong growth in demand for Digital Skills (see figure 17). Respondents in 2018 said they thought 64 percent of jobs require Digital Skills globally but expected that 84 percent would require them in 2028. In Sub-Saharan Africa, the current demand for these jobs is 47 percent but expected by survey respondents to grow to 75 percent within the next decade, just 10 percentage points lower than the anticipated global levels. The faster growth rate of Digital Skills in Sub-Saharan Africa and Ghana suggests the rate of digital transformation will likely be higher in these regions. The supply of digitally-skilled labor in Sub-Saharan Africa and Ghana will need to increase to meet these anticipated labor market needs."

In the context of the first phase of the technical assistance of the Digital Skills Country Action Plan, the World Bank and IFC collaborated to undertake a similar study in 2020 for five additional countries (Cote d'Ivoire, Kenya, Mozambique, Rwanda and Nigeria). While the methodology was the same as for the Ghana study, the new study adopted the Digital Skills frameworks, for general digital skills and for the ICT professions, used in the DE4A and in this Guidebook.

The study highlighted that just one one-third of the estimated additional training over the period 2020-30 would be required for the new workforce entrants joining during this period, over two thirds would be required for reskilling the existing workforce. The overwhelming demand is for foundational and intermediate level skills for non-ICT professions. While relatively small in terms of proportions, the absolute numbers required for ICT professions (from technician level to the highly professional level) is about 3.1 million. The study findings emphasize the need for education and training institutions to train all students in general digital literacy skills, to partner with private sector training providers to scale up digital skills training, and to expand the training of ICT professionals at all levels.

1 https://www.ifc.org/wps/wcm/connect/ed6362b3-aa34-42ac-ae9f-c739904951b1/Digital+Skills_Final_WEB_5-7-19.pdf

In the absence of comprehensive data or recent surveys, a cost-effective alternative is to establish 'panels' of experts to assess what is the current demand and likely new demand. The members should be persons with comprehensive hands-on knowledge about the skills and competences needed within a given economic sector, e.g., financial services, tourism/hospitality, transport and logistics, construction etc.

The government's adoption of digital technologies is an important source of demand for Digital Skills. This will depend on the level of computerization of the public administration and reliance on e-governance. Discussions with panel experts from key "use sectors" in the public sector such as health, road maintenance, electricity could help to determine the scale of the demand.

When assessing demand, especially for advanced Digital Skills, the regional dimension should be taken into consideration. Highly specialized digital experts often see the regional (or even global) labor market as their potential source of employment. Further, web-based employment, which allows nationals to work cross borders is an important source of demand.

Forecasting the medium-term demand for Digital Skills is associated with considerable uncertainty because many African economies are vulnerable to external economic shocks and also because technological innovation is taking place at a speed never seen before. Most governments have defined priority sectors, and the plans for digitalization of public services are also known in many cases, which can aid in forecasting. However, as is the case for the identification of present-day skills needs, expert panels are an importance source of information for any forecasting exercise, including identification of sub-sectors in which the country may experience a rise in demand because of competitive advantages.

Examples of questions that can be used in these discussions are given in Box 4-2. It is important that the methodology and reporting of the findings is as rigorous as possible.

This Guidebook recommends that, irrespective of the current demand in individual countries, all countries should plan to ensure that all students in higher education and TVET institutions (regardless of the course they are enrolled in) are equipped with intermediate level Digital Skills. This is based on the

Box 4.2 Examples of Guiding Questions for Discussions with Employers

Discussions with employers in-country and in other countries where students go to work can help to provide information on the following:

- Is there a shortage of Digital Skills, and if so, at what level?
- What are the current Digital Skills gaps seen in students?
- What are Digital Skills that they need for currently open roles?
- How are digital skill needs projected to change for general roles?
- How are current gaps in Digital Skills managed?
- For advanced digital skill needs, what are the needs and how they are projected to evolve?
- How are current gaps in advanced Digital Skills managed?
- Are employers bringing in skilled labor from outside the country for these occupations?
- Are there industries/subsectors that are likely to grow because of the country's competitive advantage, trade agreements, regional integration etc.?
- What new courses need to be introduced at the university/TVET level?

expectation that all occupations (including those that are primarily self-employed in the informal sector) will require intermediate level Digital Skills. Retraining workers at a later stage is more expensive. Further, creating a pool of digitally equipped young people will enable the diffusion and adoption of digital technologies in multiple sectors.

Assessing the demand for advanced and highly specialized Digital Skills is more difficult. Graduates with these skills will be employed in the ICT sectors proper (telecommunications etc.) but a small number of them will also be employed in a variety of sectors to adapt and develop new applications – for instance, in the financial sector, health sector, infrastructure and so on. Another source of demand for highly specialized skills is the need to have faculty who can teach Digital Skills programs in universities and TVET institutions.

Box 4.3 Assessment of Demand for Digital Skills in Principal Use Sectors in ICT and Telecommunications Industries

The Digital Skills Country Planning Team should collect information on Digital Skills demand in principal use sectors, ICT and telecommunications based on information drawn from a variety of sources. The Country Planning Team can present information in two tables which can be found in Appendix 1 – Table 1(A) and Table 1(B), with the first corresponding to Principal Use Sectors that require skills corresponding to the Digital Skills framework and the second corresponding to the ICT and telecommunications sectors. Separate tables are used as the first set of sectors (the "Principal use sectors") will require skills corresponding to the Digital Skills framework and the ICT and telecommunication industries will require skills corresponding to the e-Competence framework (See Box 3.3 for definitions). Principal use sectors include government, agriculture, healthcare, education, banking, transport and logistics, E-commerce, business process outsourcing, media and entertainment, construction, services, manufacturing. The purpose is to try and assess whether the growth in jobs requiring basic, intermediate and advanced levels of Digital Skills is "very likely", "somewhat likely" or "not likely" in both the principal use sectors and ICT and Telecommunications Industries. This exercise will be important for the first iteration of the Digital Skills Country Action Plan indicated in Section 5.

If data regarding skills demand are limited, as is likely to be the case, the Digital Skills Country Action Plan can propose measures to improve the collection of labor market information, including the use of digital technologies to do so.

4.2 Assessment of the Supply of Digital Skills

Along with the assessment of demand, a preliminary assessment of the current supply of Digital Skills should be completed. Digital Skills education and training is provided by a myriad of organizations: public and private higher education and TVET institutions, private training providers, international online providers, Non-Government Organizations (NGOs) and Civil Society Organizations (CSOs). Further, many hybrid arrangements have emerged with the private sector offering courses (especially rapid skilling courses) in partnership with public higher education and sometimes TVET institutions.

Private training providers typically cater to job-seeking university graduates and employees in need of upgrading their skills and offer short duration training. NGOs/CSOs mostly engage in basic digital literacy training for persons from underprivileged families.

As a means to create the groundwork for their own products and to recruit skilled digital talent, large technology players such as Microsoft, Google, Samsung, Cisco, Huawei, and Dell have in the recent years (as part of their CSR initiatives) partnered with local organizations at different levels, from higher education to school education. The support has included supply of hardware and software, establishment of labs, training of selected groups of users, scholarships for talented youth etc.

Assessing the current state of provision of Digital Skills education and training is important to establish a baseline for the Digital Skills Country Action Plan, to determine what is feasible in terms of targets (see Section 5), and to assess which modes of provision should be expanded (for instance, courses in public and private higher education institutions, private sector training, rapid skilling courses). It is also important to understand disparities in provision between gender, rural and urban areas (or less developed regions) so that the Digital Skills Country Action Plan can address those disparities. A template for collecting this information is provided in Table 2 of Appendix 1.

4.2.1 Categorization of Digital Skills education and training programs

The following categorization of Digital Skills education and training programs can help to prepare a first approximation of the current state of provision. Figure 4.1 presents a rough mapping of different levels of digital skills to levels of education. This mapping should be taken as indicative as, especially in SSA countries, even students at the upper secondary level or in tertiary and university level programs may not have basic or intermediate level skills, since they may not have acquired them at school.

Formal education and training institutions (public and private)

Intermediate level Digital Skills for general occupations and for ICT professions

- Digital literacy courses in TVET and higher education institutions for students enrolled in non-ICT courses (ISCED levels, 4 5 and 6). Intermediate digital skills refer to proficiency levels 3 and 4, for the various competences, in the UNESCO DLGF/ EU DigComp 2.1 framework
- Certificate and diploma courses (ISCED level 4) in TVET institutions in relevant areas of digital technology, for ICT technicians. These correspond to courses at the level of e-1 and e-2 of the EU e-competence framework

Advanced level Digital Skills for ICT professions

- Undergraduate level courses (ISCED level 6) in electrical engineering, computer science, data science and related fields
- Undergraduate level courses (ISCED level 6) in other fields of engineering (mechanical, civil, etc.) which may or could have a high digital content (for instance, use of digital tools, robotics, data science)
- Undergraduate level courses (ISCED level 6) in mathematics and science
- The above should correspond to proficiency level e-4 in the EU e-Competence for ICT Professions framework

Highly specialized Digital Skills for ICT professions

- Postgraduate level courses (ISCED level 7) in electrical engineering, computer science, data science and related fields
- The above should correspond to e-4 and e-5 levels of the EU e-Competence for ICT Professions framework

(Note: even though some countries may not have a high demand for highly specialized professionals in the private sector, this group is important because they also train faculty for undergraduate courses).

For more information on ISCED levels, please refer to Box 4.4.

Short duration training and online programs

It is difficult to classify these programs by the level of skill, but a list of the main providers, training programs and the number of beneficiaries can be compiled.

Box 4.4 International Standard Classification of Education (ISCED)

The International Standard Classification of Education (ISCED) is a widely-used a global reference classification for education systems. It provides a comprehensive framework for organizing education programs and qualification by applying uniform and internationally agreed definitions to facilitate comparisons of education systems across countries.

ISCED Level 4: Post-Secondary Non-Tertiary Education

ISCED level 4 programs are typically vocational and terminal programs that prepare students for the labor market. These programs often serve to broaden – rather than deepen – the knowledge, skills and competencies of participants who have completed a program at ISCED level 3. Two orientation categories exist - general and vocational.

ISCED Level 5: Short cycle Tertiary education

ISCED level 5 programs are often designed to provide participants with professional knowledge, skills and competencies. Typically, they are practically based, occupation-specific and prepare students to enter the labor market. However, these programs may also provide a pathway to other tertiary education programs.

ISCED Level 6: Bachelor's or equivalent first-degree program

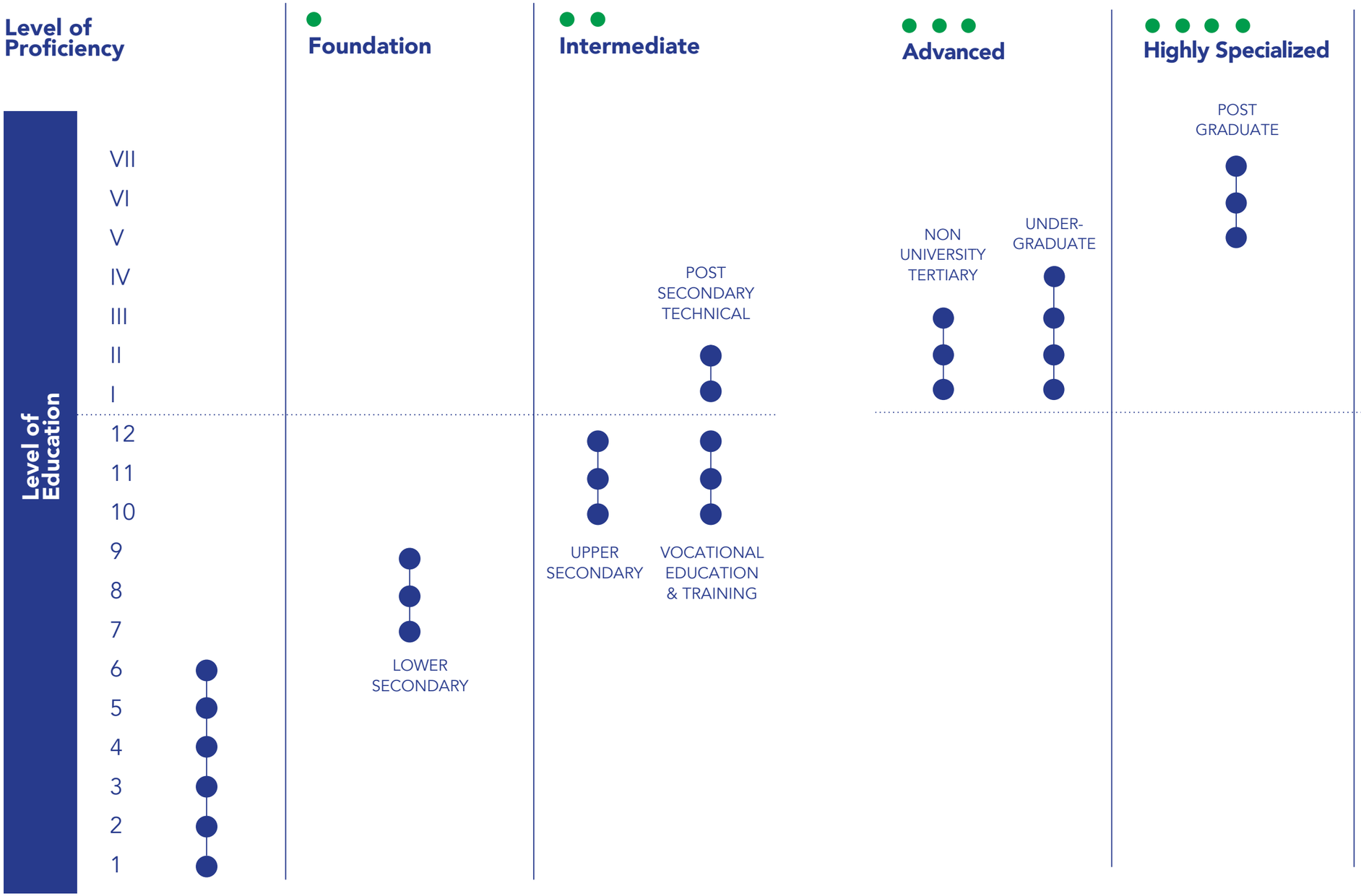
ISCED level 6 programs are designed to provide participants with intermediate academic and/or professional knowledge, skills and competencies, leading to a first degree or equivalent qualification. Programs at this level are typically theoretical but may include practical components and are informed by state-of-the-art research and/or best professional practice. They are traditionally offered by universities and equivalent tertiary educational institutions.

ISCED Level 7: Master's or equivalent long first-degree program

ISCED level 7 programs are designed to provide participants with advanced academic and/or professional knowledge, skills and competencies, leading to a second degree or equivalent qualification. Programs at this level may have a substantial research component but do not yet lead to the award of a doctoral qualification. Typically, programs at this level are theoretical but may include practical components and are informed by state-of-the-art research and/or best professional practice. They are traditionally offered by universities and other tertiary educational institutions.

Figure 4.1: Mapping education levels with 4 digital skills proficiency levels

Source: Authors' construction



Legend:

Post-Secondary Technical programs:
Certificates, Diplomas, or Associate Degrees

Non-University Tertiary programs:
Polytechnics, Institutes of Technology, Community Colleges

Undergraduate programs:
Bachelors in Mathematics, Science, Engineering

Postgraduate programs:
Masters & Doctorates in Applied Science, Applied Mathematics, Engineering, Technology

4.2.2 Digital Skills education and training programs in higher education and TVET institutions

Information on the number of institutions, enrolment and graduates from the identified programs is essential to establish the baseline and to take decisions on which programs to target for expansion/ upgradation.

The information should be collected for public and private institutions, which should be available from the higher education and TVET regulatory authorities. In some cases, a quick survey of the institutions can help to collect the information (especially on digital literacy courses in higher education institutions). It would be best to collect the information for 3 years to understand trends, but if that is not possible, information for the most recent year should be presented.

Breakdown of enrolment by gender is essential; where possible breakdown by locality (rural/urban or deprived areas) should also be provided.

4.2.3 Digital Skills training provided by private and online training providers

While it may be difficult to get details on each program, the Digital Skills Country Action Plan should provide information on the following

- Main online providers (e.g. Coursera, Udemy, Dovilearn, etc.)
- Main private digital firms offering stand-alone training or in partnership with education institutions (e.g. Google, Microsoft, Huawei, Dell)
- Other private training providers

Obtaining some information on the enrolment in these programs and the type of programs offered (e.g. pre-employment, while in employment, content, duration etc.) will provide a baseline about the extent of the Digital Skills training market.

5 Setting Ambitious and Realistic Targets for the Digital Skills Country Action Plan

How should the Country Planning Team set goals and targets for Digital Skills attainment and for the strategies that will contribute to improving Digital Skills? In order to accelerate their pace of development in the digital economy, these goals should be ambitious. On the other hand, they should take into account the demand for Digital Skills in the economy (current and projected), the current level of provision of Digital Skills (baseline) and the order of magnitude of resources required to reach the goals (financial and human resources).

This section provides guidance on how this could be done systematically to enable decision-makers to set the high-level goals and targets, through an iterative but fairly rapid process, at the beginning of the planning process. The Country Planning Team should prepare high level costs estimates for three "levels of ambition" in order to help key decision makers to decide on the scale of implementation. A plan that costs $500 million versus a plan that costs $100 million over the same time period may be highly desirable, but practically impossible to achieve. Apart from the financial resources required, there may critical capacity constraints that may be impossible to overcome in a short time frame.

After the high-level goals and targets are approved by the decision-making authorities, more detailed planning should be undertaken to identify goals and targets for key strategies, activities and tasks.

5.1 Anticipated Growth in Demand for Digital Skills and Expansion of the Education System

The first issue to consider is the extent of demand for intermediate and advanced Digital Skills in the economy currently and the expected forecast. Section 4 provides some guidance on how this could be done, using data from surveys, studies and other sources and expert panel discussions. Based on this, the Country Planning Team could make a summary qualitative assessment of the current situation and of anticipated growth in demand over the medium term, as shown in Table 5.1.

The Digital Skills Country Action Plan should indicate how the team arrived at this assessment and what is meant by "essential", "rapid" or "accelerated" growth (as these may differ by country).

The second issue to consider is the anticipated growth in the higher education and TVET system over the planning period. This factor is important because it incorporates key cost drivers of the Digital Skills Country Action Plan – the number of institutions and, in particular, the number of students. Because of the growth in the youth population, the expansion of secondary education, and the increase in the number of students graduating from secondary school, the higher education and TVET system will also expand. The government may have plans to accelerate the participation of young people in post-secondary education. The anticipated growth in the higher education and TVET system may be laid out in the Education Sector Strategy/Plan of the country. If this is not available, projections can be made based on recent trends in enrolment growth and/or transition from upper secondary education and policy directives.

Table 5.2 provides a format for recording the anticipated growth in the system, in terms of the Gross Enrolment Ratio and the number of students at each level. It is important to record the gender break down of anticipated increases in enrolment.

Table 5.1 Summary Assessment of demand for Digital Skills

	Baseline – (Current Year) (Excess supply/Some shortages/Large shortages)	Assessment of growth in jobs over the next five years. (Whether Minimal, Average or Rapid – indicate what the range of growth rates for each level)
Intermediate level Digital Skills		
Advanced level Digital Skills		

Table 5.2 Projected growth of enrolment in higher education and TVET

	Gross Enrolment Ratio (GER) in baseline year	Number of enrolled students in baseline year	Projected GER in five years	Projected number of enrolled students in five years	Projected number of graduates in five years
Higher Education (with male/female break up)					
TVET (with male/female break up)					

5.2 First iteration: determining "three levels of ambition" for overall goals and strategies in the Digital Skills Country Action Plan

The purpose of the first iteration is to determine the "level of ambition" of the Digital Skills Country Action Plan, to assess how much this would cost, the cost can be reasonably financed using domestic and external sources (or private sector participation), and whether the human resources exist to manage the implementation of the plan. These "levels of ambition" translate into different scenarios of growth, labelled "Minimum", "Average", and "Ambitious".

A simple spreadsheet-based tool called Costing Template for Scenario Planning has been developed to estimate costs using the indicators based on strategies of the Digital Skills Country Action Plan. Information on the Costing Template for Scenario Planning and some indicators is provided in Box 5-1. The tool generates high-level estimated costs of each "level of ambition", using the baseline and target values of each indicator and related unit costs.

Choosing the targets for the overall goals for the three "levels of ambition" should be based on (i) assessment of demand growth and the (ii) overall expansion of the education system, discussed earlier. If a country is expecting only a modest growth in demand for Digital Skills, the target for its "level of ambition" should be minimal or average. If its higher education and TVET system is set to expand rapidly, this means that the number of students will in any case increase substantially, hence a relatively small share of them need to be provided with digital skills to meet the expected demand.

For each "level of ambition', targets need to be determined for the key indicators under each of the Strategies 2-5 ●,●,●,●. (For ● Strategy 1, which comprises development of policies and frameworks, the costs are fixed costs relating to number of policies that need to be developed and

Box 5.1 Costing Template for Scenario Planning

The Costing Template for Scenario Planning enables country planning teams to quickly derive "high-level" cost estimates for 3 scenarios using a small set of indicators for the five strategies. Country planning teams will first fill baseline values and then set three targets for each indicator (aligned to the "level of ambition", which is based on the anticipated growth in demand and the current level of digital skills). Targets are also set for overall expansion of the education system as shown by the Gross Enrollment Ratio. Population growth is an exogenous figure that drives expansion of the system. Some baseline values would be actual figures like the number of education institutions at various levels, enrollment at these institutions, and number of teaching staff, and others would be estimates like percentage of students currently receiving intermediate level digital skills, cost of developing new courses, etc.

The spreadsheet-based model derives cost estimates for the three scenarios based on the expected growth of the education system, the baseline and target values for the indicators and the unit costs. The summary tables provide information on the anticipated physical expansion of the system (institutions, teachers and students); the cost per strategy and the total recurrent and capital cost of each scenario. These data allow the country planning team to assess the realism of the scenarios and select the scenario (or "level of ambition") that is appropriate for the country.

is not significantly affected by the number of institutions, courses or students). It is important to remember that these strategies need to be coordinated. For instance, it is not possible that all institutions use online programs that rely on high speed broadband unless these institutions have access to affordable and reliable internet services. Further, the baseline value of these indicators need to be taken into account: for instance, is it feasible to reach 100 percent connectivity for all institutions in five years, if the baseline is just 10 percent at present.

Ensuring consistency of the targets for the strategies (within each "Level of Ambition" scenarios) is important to arrive at realistic estimates.

5.3 Decisions Regarding the First Iteration of the Plan

5.3.1 Cost of the Three Scenarios

The spreadsheet will calculate costs for each of level of ambition, including recurrent and capital costs and other breakdowns useful for decision making.

At this stage, the key questions to ask are:

- How do the costs of each scenario compare with the current budget for higher education/TVET?
- Which strategies cost the most?
- What are potential sources of financing? (domestic budget, external, private)
- On the basis of costs and availability of financing, which scenario is realistic?

5.3.2 Human resource capacity constraints

Even if the costs are reasonable or can be financed, the country planning team should consider the human resource requirements for implementing each scenario. Often, these can be critical constraints to implementation. Some questions to consider are:

- Are there sufficient senior level managers in the Ministry or associated government agencies to oversee and steer the plan and its strategies?
- Is it possible to hire and retain specialized staff with the required technical knowledge for key functions (both at the Ministry level and in institutions)?
- Can adequate numbers of faculty in higher education and TVET institutions be recruited/trained to implement new Digital Skills education/training programs or to use technology in teaching-learning?
- What can be done to address critical human resource capacity constraints?

These are admittedly qualitative judgements; however, they will go a long way in deciding on a realistic plan.

5.3.3 Selecting the most ambitious scenario within existing constraints

The Country Planning Team should develop a recommendation on the "level of ambition" to be adopted. This recommendation should be presented to the appropriate decision-making body chaired by the Minister or higher level authority to make the final decision.

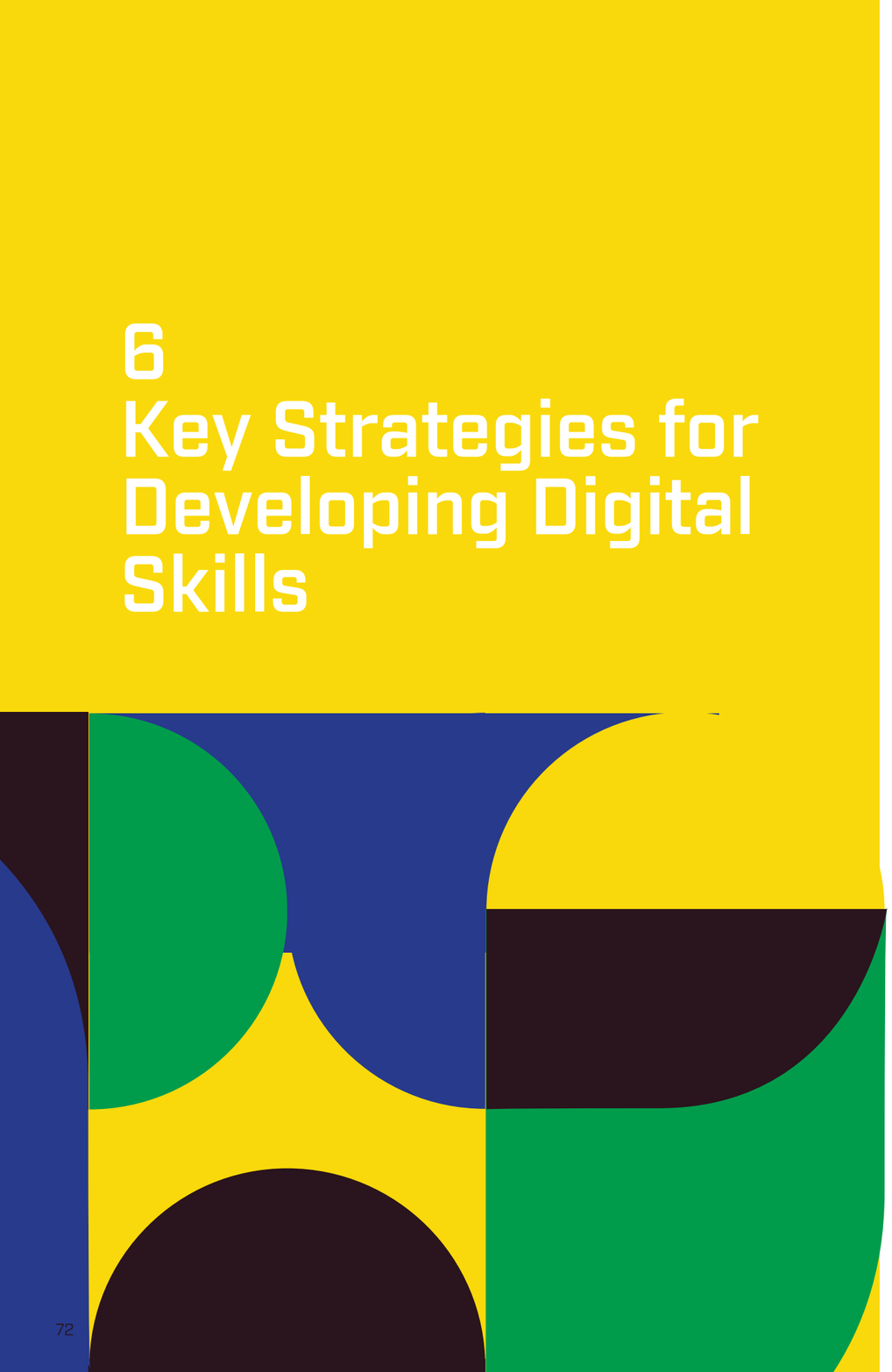
The decision should be based on the following parameters:

» The selected scenario should correspond to the anticipated demand for Digital Skills

» Likelihood of targets of the chosen scenario being achieved including

- Ability to raise sufficient funding
- Ability to develop necessary partnerships
- Ability to hire and retain competent staff for critical leadership functions
- A practical implementation strategy involving the key institutions and regulatory bodies

6 Key Strategies for Developing Digital Skills



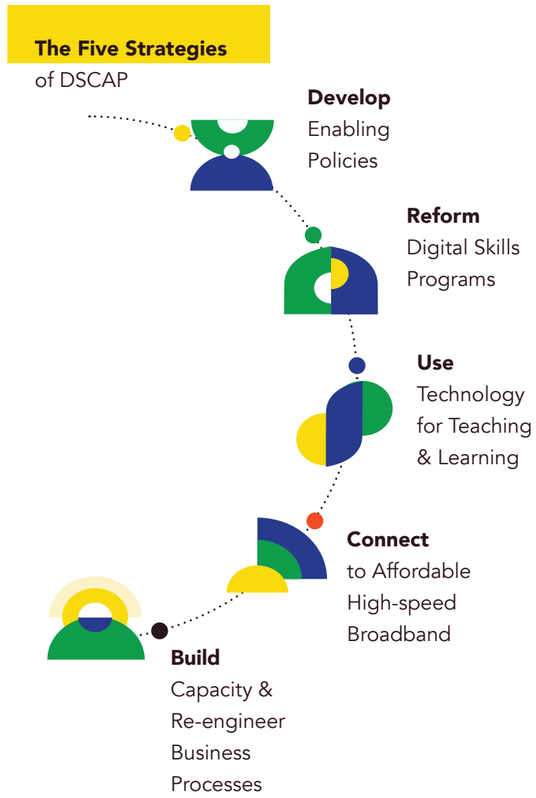


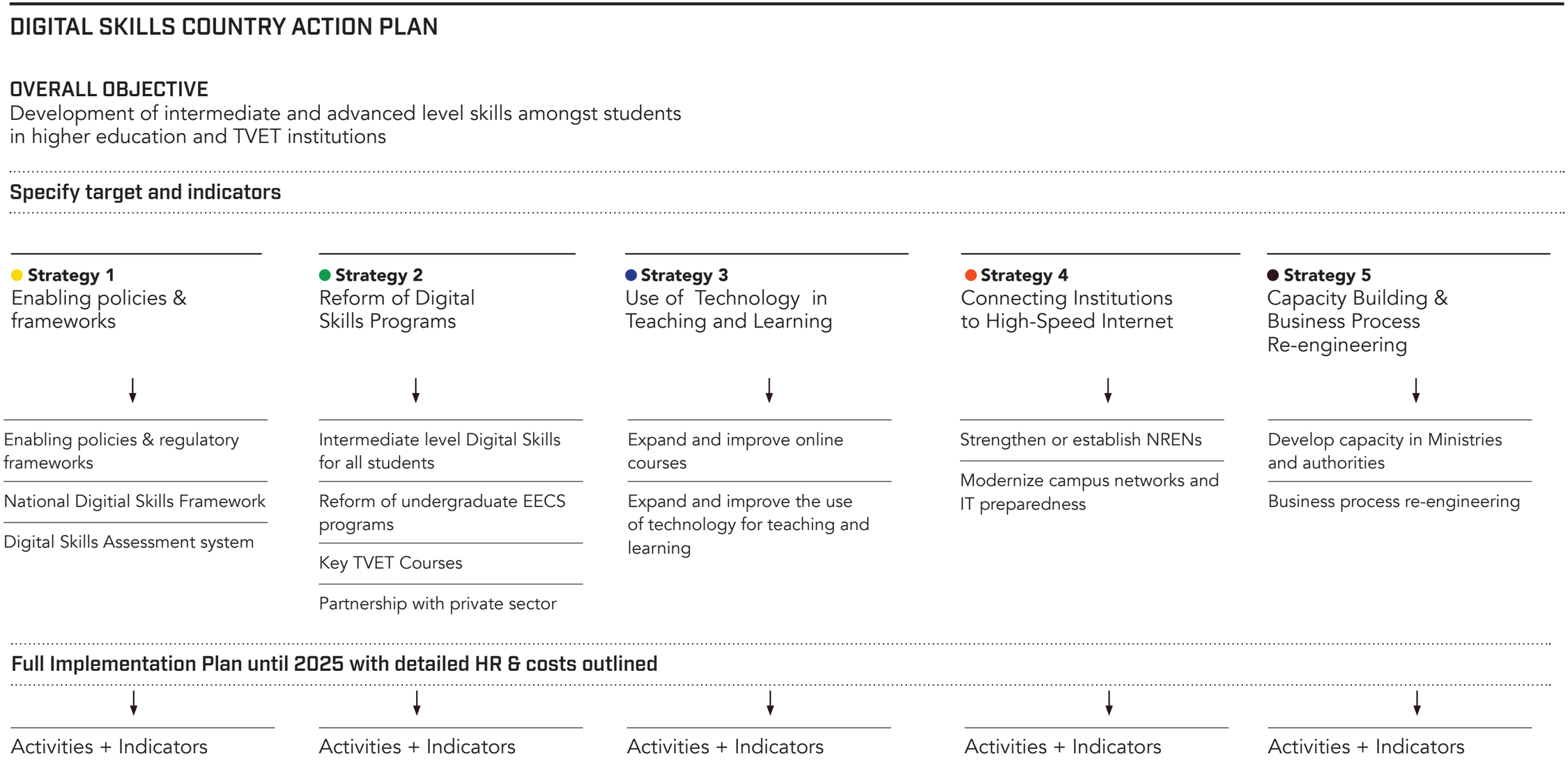
Figure 6.1: Coordinated approach of the 5 strategies to develop Digital Skills of students

This section outlines the key features of the five main strategies proposed for preparing the Digital Skills Country Action Plan. More detailed guidance on operationalizing these strategies is provided in Part 2 of the Guidebook.

- Strategy 1: Establish enabling policies and develop Digital Skills framework
- Strategy 2: Reform of Digital Skills programs
- Strategy 3: Enhance use of technologies in teaching and learning
- Strategy 4: Connect higher education and TVET institutions to affordable high-speed broadband
- Strategy 5: Capacity building and business process re-engineering in Ministries

Figure 6.2 provides a diagrammatic representation of how these strategies contribute to delivering the overall goals of the Digital Skills Country Action Plan, namely the development of intermediate and advanced level skills amongst students in higher education and TVET institutions.

Figure 6.2: Overview of the structure of the proposed Digital Skills Country Action Plan



6.1 ● Strategy 1: Establish enabling policies and develop Digital Skills framework

Most African countries lack critical policies as well as a Digital Skills framework to foster the development of high-quality Digital Skills education and training programs. They also lack regular Digital Skills assessments which allow them to track progress. Addressing these gaps in the policy environment should be an integral part of the Digital Skills Country Action Plan.

6.1.1 Establish enabling policies and regulatory frameworks

Many countries have national ICT strategies, national broadband strategies as well as education-sector specific strategies (some countries have ICT strategies specific to higher education). Several countries have adopted laws and established regulatory agencies, instruments and rules which provide oversight and implement and enforce legal and policy mandates. Further, the country's e-government strategy affects network connectivity, policies regarding procurement of equipment and services and adoption of digital technologies across agencies. Taxation and fiscal policy affect the costs and incentives for broadband services, equipment and digital tools. Some governments have introduced interoperability standards to encourage greater competition in the IT sector. Reform of the telecommunications sectors can also bring about reductions in the price of broadband. These policies, strategies, laws and regulations provide the overarching framework within which the Digital Skills Country Action Plan will operate.

The policy environment in a country, such as the rule of law, the support measures in place for companies, both foreign and domestic, as well as taxation incentives are part of the conducive environment of a country for private sector investment and development in digital skills training.

Enabling policies are critical for the success of the Digital Skills Country Action Plan. National policies, strategies, regulations and standards will affect the extent to which Digital Skills programs can be reformed, the use of technology in teaching and learning and the spread of broadband connectivity. The planning team should consider whether they are adequate or they need strengthening or modification. The following should be reviewed:

- National ICT/broadband strategy or related measures: These will usually indicate the plan for extending broadband connectivity. This will be important for ● Strategy 4.

- Universal Service Access Funds: These funds can subsidize demand for broadband connectivity and also improve affordability of devices in rural or poor areas or for poor beneficiaries. This could be important for Strategies ● 2, ● 3 and ● 4.

- Taxation policy: The planning team can consider whether there are special provisions for the use of IT equipment in the education sector, which is important for Strategies ● 2, ● 3 and ● 4.

- Reform of the telecom sector: Such reforms can drive down the price of broadband through increased competition which could have huge implications for Strategies ● 2, ● 3 and ● 4. Together with strengthening of National Research and Education Networks (NRENS – ● Strategy 4), this increase access to high-speed broadband and the uptake of technology in higher education and TVET.

The cost of broadband connectivity is also an important consideration and policies that affect it (like taxation policy) should be reassessed. Other policies that can constrain or encourage the development of Digital Skills training include: use of electronic identification, digital financial payments, privacy, data protection and regulation of cross-border use of data, standards for cybersecurity, Artificial Intelligence. Government policies on procurement and HR also need to be reviewed since these determine recruitment of digital talent in the public sector. Each of these areas will have an important effect on the ability of each Country Planning Team to implement sustainable and scalable Digital Skills Country Action Plans.

There are also specific policy areas in the education sector that may require modification in order to address the opportunities and challenges created by digital technologies. These include:

- Accelerating curricular reform: The process of reforming curricula and introducing changes to courses/new courses are cumbersome and need to be adapted to the digital age. Required changes to be made to processes and institutions responsible for reviewing/ authorizing and accrediting courses in higher education and TVET should be identified. (Important for ● Strategy 2)

- Regulatory framework for partnership between public education institutions and the private sector or NGOs: In many cases, regulations are outdated and restrict the delivery of Digital Skills programs that may be readily available on the market. (Important for Strategies ● 2 and ● 3)

- Regulations regarding distance and online learning: These programs offer a great opportunity to increase access to higher education and TVET but existing regulations are based on traditional distance learning modalities. (Important for Strategies ● 2 and ● 3).

- Regulations and standards regarding e-learning content: These enable the use of content across different devices and platforms.

- Intellectual property rights regarding online content: The issue gains significance when faculty develop online content and when they are working across multiple universities.

The Guidebook recommends that the Country Planning Teams identify and prioritize key policies and regulations that should be updated in order to implement the activities of the Plan. Policy and regulatory reform activities need to be included in the Digital Skills Country Action Plan and costed, as this may require specialized technical assistance in some cases.

6.1.2 Develop a Digital Skills Framework

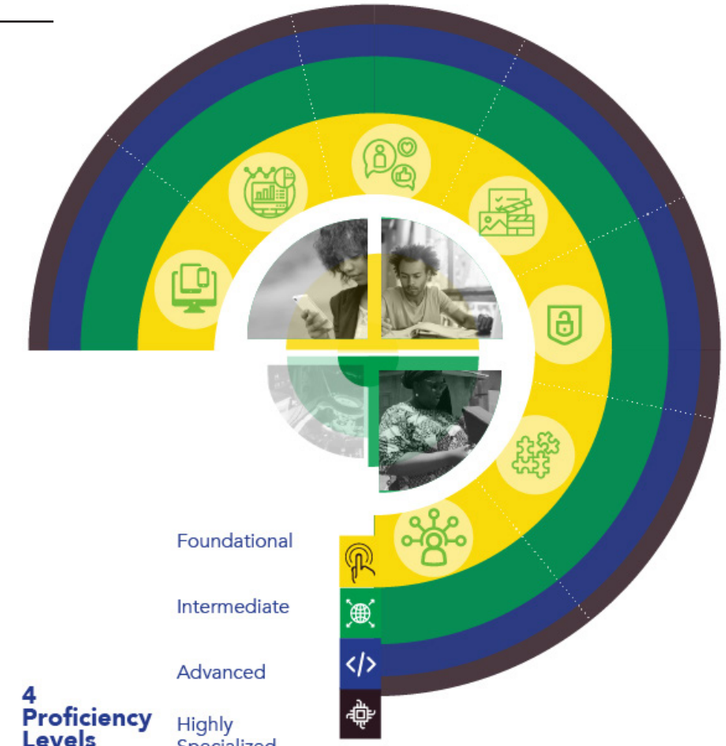
In order to reach the goal of developing Digital Skills at different levels, countries need to have a Digital Skills framework. Such a framework sets out key digital competences and proficiency levels thus enabling individuals, education and training institutions, and employers to identify the skills that are required in different occupations. Countries across the world are adopting Digital Skills frameworks to raise the level of Digital Skills proficiency in the population. While it is possible to incorporate digital competences in an overall skills framework, countries where digital technologies have spread find it more useful to develop a specific framework for Digital Skills. Digital Skills frameworks remain rare in the African context.

Developing a framework requires detailed technical work and stakeholder consultations. The Guidebook suggests adapting existing frameworks such as the EU DigComp 2.1 (developed by the European Commission) the UNESCO Digital Literacy Global Framework (which builds on the EU DigComp framework), which are relevant for many skills levels and occupations, and the European e-Competence Framework (e-CF) for ICT professionals. (See Figures 6.2 and 6.3).

The Digital Skills Country Action Plan should outline the steps required to adapt these frameworks to the country context such that they are relevant and meaningful for stakeholders. Regular updating of the Digital Skills framework should be included as an activity in the Digital Skills Country Action Plan

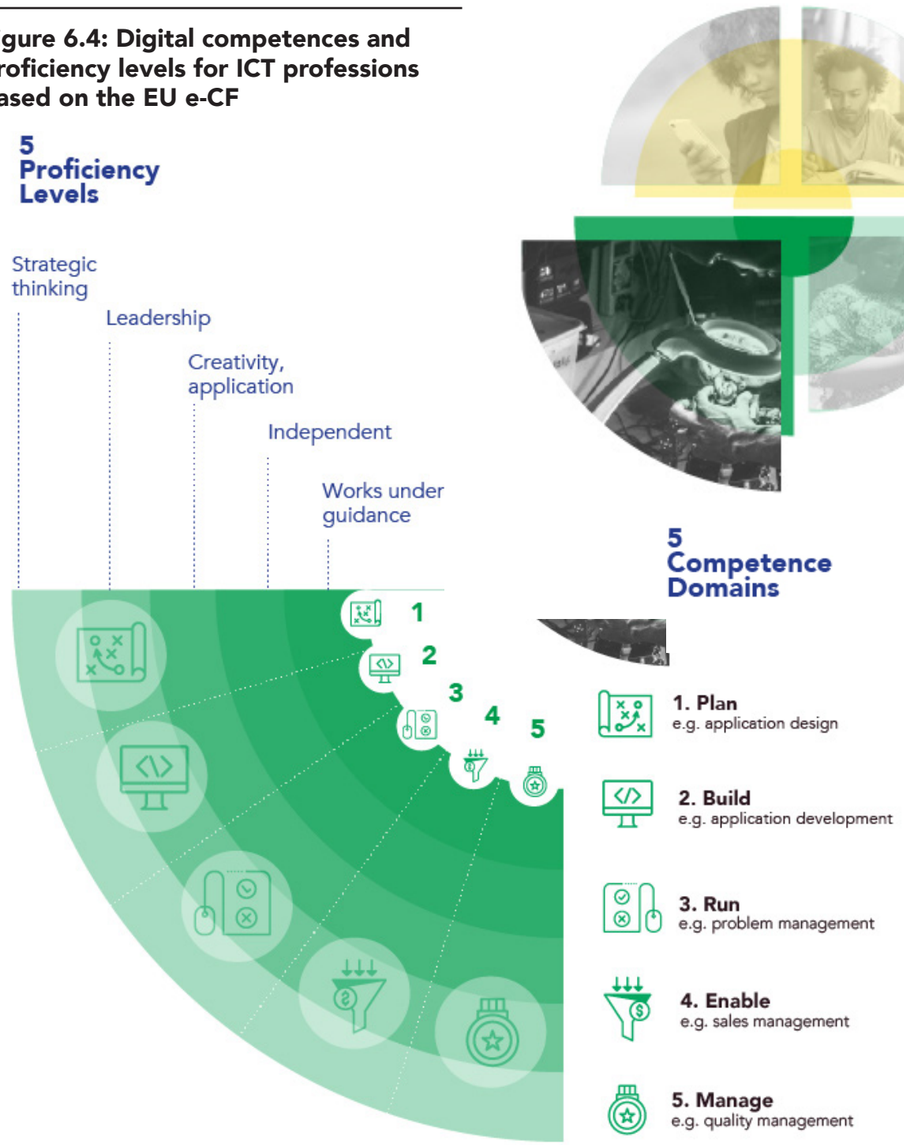
The Guidebook also uses the above-mentioned frameworks to indicate different levels of Digital Skills: basic, intermediate, advanced and highly specialized.

Figure 6.3: Digital Skills Framework (based on the UNESCO DLGF)



for citizens & general occupations

Figure 6.4: Digital competences and proficiency levels for ICT professions based on the EU e-CF



for ICT professions

6.1.3 Digital Skills Assessments

This is an important area for the Digital Skills Country Action Plan as it allows monitoring of progress in Digital Skills acquisition amongst higher education and TVET students, which is the primary goal of the Plan. Currently, almost no African country has a system of Digital Skills assessment, although these are increasingly being used in other regions.

Most Digital Skills assessments should be done at the level of the higher education or TVET institution, as the programs, courses and new digital technologies for teaching-learning will be implemented there. The Country Planning Team can, however, mandate that such assessments should be conducted based on the Digital Skills Framework adopted by the country; this could be a condition, for instance, for institutions to receive additional funding under the plan.

To assess progress in the country as a whole, and over time, population-based assessments of Digital Skills at the foundational and intermediate level are useful, even if confined to the population of higher education and TVET students, as institution level assessments do not necessarily allow comparisons across institutions. The sample should have a size that makes it representative for the population to the tested; 10 percent of a cohort would usually be sufficient. The assessment indicators and instruments should be mapped to the Digital Skills Framework. Finally, the assessment should be repeated on a regular basis (suggested every three years) in order to measure changes over time.

Countries can also undertake special assessments of students in core advanced Digital Skills programs (such as electrical engineering and computer science), which are benchmarked to international assessments. Such assessments have the advantage of enabling comparison of domestic students with international students. In the context of a globalized market for advanced Digital Skills, such comparisons can be very useful to benchmark the quality of teaching-learning in African higher education institutions.

The Digital Skills Country Action Plan should include Digital Skills assessments in one or more of these areas (institution level, national level, international comparisons).

6.2 ● Strategy 2: Reform of Digital Skills education and training programs

The second critical strategy for the Digital Skills Country Action Plan is the Reform of Digital Skills courses and programs in higher education and TVET institutions. This is the core of the Plan, as without reforming the content of existing courses or introducing new ones, the acquisition of relevant Digital Skills by African youth remains unlikely. Although a more comprehensive list of courses programs that need to be reformed or introduced may be developed once the Digital Skills Framework is in place, country planning teams should start with a preliminary list of programs. In addition to "high profile" courses such as Machine Learning, Data Science and Artificial Intelligence, countries also need to consider new courses that will train people to set up and maintain advanced digital infrastructure. Many, though not all, of these new courses will be at the TVET level.

The current level of production of graduates from ICT programs at the TVET level and from engineering and computer science programs at the undergraduate level is inadequate relative to the needs emerging from the expansion of the digital economy. However, many studies show that many current graduates also remain unemployed because of the lack of the right skills. The Digital Skills Country Action Plan should also focus on expanding enrolment (where appropriate) and also on improving quality.

The Guidebook proposes that countries should consider five main areas within this strategy.

- First, enable all students in higher education and TVET institutions, irrespective of the specific course they are studying, to acquire at least intermediate level Digital Skills.

- Second, expansion and reform of electrical and computer science and related programs at the undergraduate level, as they are critical to many core sectors in the digital economy.

- Third, selected postgraduate courses (Masters and Ph.D level) should be expanded and reformed to produce graduates with highly specialized Digital Skills, as well as qualified faculty for new programs.

- Fourth, undertake reform of key courses at the TVET level, in particular courses related to ICT professions like, installation and maintenance of digital equipment and infrastructure, and information security.

- Fifth, partnerships with the private sector should be built for rapid skilling programs to meet shortages and spikes in demand in particular areas.

The reform of all programs should cover: curricula, teaching methods and use of technology in teaching, equipment and facilities and assessment systems. Faculty recruitment and support for faculty are critical elements that should be included in the Plan. The latter covers on-going faculty development and continual technical support to adopt new pedagogical approaches, including use of technology and digital resources, as well as incentives for faculty.

The reform of Digital Skills programs will need to be implemented at the institution level, as each institution has to prepare a detailed plan. The national Digital Skills Country Action Plan should

highlight priority courses and programs that should be reformed. It can indicate how many institutions, courses and programs will be prioritized for reform (without identifying the specific institutions in advance) and it can indicate how the institutions will be incentivized to implement these reforms (for instance, through a competitive grant mechanism for incremental funding). ,. The Plan can also include other national level activities, such as the preparation of guidelines and policies to help the institutions and coordination with the roll out of Strategies ● 3 and ● 4. The Plan should also indicate how the national higher education and TVET regulatory and quality assurance authorities will be strengthened to streamline the process of approving new courses and programs (● Strategy 5), so that bottlenecks are removed. .

Active measures should be taken to encourage enrolment of female learners and learners from disadvantaged backgrounds.

6.2.1 Enable all students to acquire intermediate level Digital Skills (programs at ISCED level 4, 5, and 6)

It is recommended that all countries ensure that all graduates of higher education or TVET institutions have at least intermediate-level Digital Skills. This provides a baseline level of competency for all graduates in all domains, an essential step in reaching national goals. The UNESCO Digital Literacy Framework presents some examples of Digital Skills required in different professions especially non-ICT related occupations.

Part 2 of the Guidebook outlines options for implementation including mandating implementation at institutions, incentivizing institutions to implement these courses or to partner with existing content providers (either in-country, private providers or otherwise) to achieve the roll-out.

Institutions must ensure that their content is regularly updated to reflect changing technology landscapes as well as improvements in Digital Skills levels on intake from secondary schools.

6.2.2 Reform advanced level digital skills programs at Undergraduate level (programs at ISCED level 6)

Reform of key undergraduate programs is critical, but it is also a difficult and challenging process. The Guidebook proposes that the core advanced Digital Skills courses such as electrical engineering and computer science (and related fields) should be reformed as they drive the adoption of digital technologies. Depending on the "level of ambition" of the plan, other engineering, science and mathematics programs can also be reformed. Given that mathematics and physics form the foundation of the engineering and computer science courses, there is an argument for reforming these courses together but in cases where this is not possible, efforts should be made to include essential competences such as robotics, data science/data analytics across these courses.

Reform of the curricula starts with benchmarking of courses with international universities that are appropriate to the country context, in consultation with local and foreign employers, also including restructuring of the curriculum content and assessment methods. EU's E-Competence Framework is helpful in determining what skills are required at various levels for ICT related occupations. For example, Hogeschool Utrecht, The Netherlands used the e-CF as a foundation to their IT professional education (bachelor and master courses).

Integration of technology in teaching should also be considered (see ● Strategy 3), as well as the requirements of labs, equipment and infrastructure. As stated earlier, an important (but often neglected aspect) is faculty development and continuous support to adopt new pedagogical approaches, faculty incentives and training of new faculty through high quality Masters and Ph.D. programs. Bridge courses could be introduced to enable secondary school leavers to enter these high quality programs.

6.2.3 Reform highly specialized digital skills programs at postgraduate level (programs at ISCED Level 7)

Reform of the undergraduate level engineering and computer science programs will require major faculty development efforts and also of related post graduate programs, which train the new faculty at the university level. Given the high cost and the need for ensuring quality, the Guidebook proposes selecting those courses that directly support the core courses at the undergraduate level. The Digital Skills Country Action Plan would need to assess whether high quality postgraduate courses can be offered within the country, or whether regional initiatives should be leveraged to help train these faculty.

6.2.4 Reform TVET level courses for ICT Professions (programs at ISCED Level 4, Intermediate level skills)

Courses that lead to commissioning, maintenance and repair of hardware, equipment and infrastructure could be prioritized, as digital technologies spread through the economy. Additional specialized courses are best developed together with industry so that they are industry-certified or are at least industry relevant.

6.2.5 Rapid skilling programs (in institutions offering programs at ISCED level 4-6)

The Digital Skills Country Action Plan should actively encourage the partnership between higher education institutions (in particular) and the private sector to provide rapid skilling programs, particularly in the software industry. Changes to curricula take time, and rapid skilling programs (bootcamps) can meet periodic spikes in demand for people with skills in specific areas. The Country Planning Team should not select specific programs, but create guidelines or reform regulations to enable a deeper partnership with the private sector.

For more information on ISCED levels please refer to Box 4.3 of the guidebook.

6.3 ● Strategy 3: Enhance use of technologies in teaching and learning

With the prospect of increased connectivity to affordable high-speed broadband (● Strategy 4), and the need to reform Digital Skills programs (● Strategy 2), there is enormous potential for and an urgent requirement to enhance the use of technology in learning. This is also one of the most difficult to design and implement, as seen by numerous failures in the past. The most critical issue to be addressed is the need for deep integration of technology into the education process. Traditionally, IT departments in education institutions focused on devices and networks, while faculty and academic leadership continued to teach students in typical ways.

The use of digital technology in teaching contributes directly to the goal of the Digital Skills Country Action Plan of raising the Digital Skills levels of students in key competences outlined in the Digital Skills framework in three ways. First, the use of online teaching can greatly expand access to post-secondary education and training and can multiply the number of students in higher education and TVET institutions who can be trained in intermediate level Digital Skills. Second, the use of digital technology in teaching is an essential mechanism for students and teachers to become familiar with digital tools, use of digital information, creation of content and so on, and contributes to the development of digital competences. Third, technology-driven learning has the potential to facilitate new pedagogic strategies, enable access to enormous digital resources from across the world, open up opportunities to improved

research methodologies, and thereby improve the quality of Digital Skills programs that will be reformed or introduced.

The Guidebook proposes that countries should consider two main areas under this strategy: (i) expanding and improving online course work in both distance learning and brick and mortar settings and (ii) enhancing the use of technology in teaching and learning in classrooms.

● Strategy 3 is intimately connected with Strategies ● 2 and ● 4 and hence a coordinated approach is likely to yield the best results. For instance, if a decision is made under ● Strategy 2 to provide intermediate level Digital Skills training to all students in higher education and TVET institutions (irrespective of course), an online course may be the best way to achieve this objective. Similarly, if a decision is made to reform certain Digital Skills programs at the undergraduate level under ● Strategy 2, integration of digital technologies and tools may be an important part of this reform. Finally, the extent to which online course work and digital technology can be used will depend on the extent of broadband connectivity. Decisions on which universities and TVET institutions will be connected at what speed (under ● Strategy 4) will affect the extent to which technology can be used effectively.

Implementation of this strategy will largely be at the level of each higher education or TVET institution. In the Digital Skills Country Action Plan, the country planning team can set the vision, identify the policies and options that institutions can adopt, set priorities for the courses and institutions that will be prioritized for funding and outline the indicators and means that will be used to monitor implementation and progress. At the implementation stage, institutions which seek additional funding can be required to develop an institutional plan to show how they would integrate technology into teaching-learning.

Depending on a country's existing capacity, teams might consider pooling resources and/or setting up dedicated instructional design units at a national level (e.g., within the NREN) to provide greater support to universities and TVET institutions. These efforts to save costs should be balanced against institutional autonomies and efforts necessary to make adaptations to meet their instructional programmatic needs.

A number of issues are common to both areas of this strategy including: creating enabling infrastructure and connectivity; increasing access to devices and data packages for students and teachers, including ensuring that course offerings can be given on different devices; streamlining the organization and systems within educational institutions to support the integration of technology; collecting data regularly to monitor progress; creating incentives for students and faculty to learn and use the technology and building human capacity on a systematic, regular basis, especially faculty. Critical policies that need to be developed or reviewed relate to procurement and intellectual property. Part 2 covers these issues extensively.

6.3.1 Expanding and improving online course work (distance learning and brick and mortar settings)

Online coursework can play an important role in the acquisition of Digital Skills at all levels, but courses must be carefully chosen, designed, delivered, supported and paired with the appropriate devices, bandwidth and partners. Online courses tend to have lower student retention and completion rates and face number of challenges in implementation. Part 2 provides detailed content on each of these areas of work. Particularly for TVET institutions where capacity may be low, but also in the case of higher education institutions, some of these actions may need to be done at the national level.

The Guidebook proposes that country planning team consider the following approach to establish priorities and define activities

- Select the courses that will contribute directly to the goals of the Digital Skills Action Plan and can be offered online: for instance, digital literacy courses that provide intermediate level skills to all students, some courses in the Digital Skills programs (for ICT professions) that will be reformed, or other courses with significant enrolment demand. In low-capacity contexts, only a few should be prioritized.

- Adopt/Set quality standards: Specific quality assurance processes and standards should be developed covering online course design, program design, faculty development, support services and student outcomes. The Digital Skills Country Action Plan can include the development of such frameworks, which institutions would be encouraged to adopt.

- Identify the management of online courses: Two main options exist: build internal capacity or contract with an Online Program Manager (OPM) in one or multiple institutions, each of which has its own challenges. The Digital Skills Country Action Plan should propose mechanisms through which due diligence on OPMs and investigation and securing sustainable pricing can be done at the national level, which can be used by institutions; or help universities to create their own capacity for online courses, which would include setting up dedicated Instructional Design units at each university or at an NREN level.

- Select digital tools for online courses: These fall into two major categories – Learning Management Systems (LMS) and online content. The Digital Skills Country Action Plan can propose means by which the Country Planning Team can help evaluate LMSs for use across multiple institutions and determine whether centralizing an LMS is feasible with incentives to universities to use them.

- Increase access to devices and data bundles: Device shortages limit access in measurable ways, which is why procurement of devices is often a top priority in technology implementations. When creating a device strategy, the Country Planning Team should first consider what devices are already available in-country to support the initiative, and how those devices might be used for course delivery. Given the pervasiveness of mobile devices, countries should think creatively about the use of mobile as an opportunity to expand reach with less investment in devices.

- Build learning centres: Students enrolled in online courses need

support. The Digital Skills Country Action Plan should include creation of learning "hubs" with instructional support, connectivity and devices for use by distance learning students. Partnerships with private companies can be explored.

6.3.2 Expanding and improving the use of technology for teaching and learning in classrooms

Integrating technology necessitates, in most cases, a comprehensive revision of courses, procurement of digital tools, development of faculty, and upgrades of technology. Although most of these activities must happen at the institution level, the Country Planning Team can lay out the steps that need to be followed and the activities that need to be financed. There are several options for implementation: mandate or incentivize a few courses to incorporate technology across all institutions; focus on a few universities and TVET institutions with the highest capacity and scale their offerings; procure technology tools and disseminate them centrally.

The Guidebook proposes that the following activities be considered in the Digital Skills Country Action Plan:

- Select courses: The Country Planning Team should prepare a list of priority courses that should integrate technology, even though the final decision may be made at the institution level.

- Select digital tools for improving teaching-learning: Digital tool selection is often one of the most complex processes, as it requires content knowledge to determine quality, pedagogical understanding to assess implementation strategy, technical knowledge to determine feasibility, interoperability, and support demands, and ecosystem/market knowledge to negotiate costs and/or find alternatives. Tools are available for students, teachers, administrators for different purposes. The Digital Skills Country Action Plan should propose methods by which the national level can support these efforts and higher education and TVET institutions can implement them. It may make sense for countries to pool resources to procure tools, depending on the needs and current holdings of institutions.

- Increase access to devices and equipment: The same issues apply as for online courses (see above). However, for advanced digital skills programs (eg. computer science and engineering courses), as well as for TVET courses, additional devices and specialized equipment will be required.

- Faculty development, incentives and technical support for technology integration: Ensuring that all stakeholders are adequately prepared to meet the goals is crucial as merely upgrading infrastructure and purchasing more devices will not automatically lead to more technology usage and learning. Students and faculty should be incentivized to learn and use technology. The Digital Skills Country Action Plan should include activities in this area.

6.4 Strategy 4: Connect higher education and TVET institutions to affordable high-speed broadband

High-speed broadband connectivity for higher education and TVET institutions is at the heart of reaching the goals of the Digital Skills Country Action Plan and is critical to achieving all the other strategies. The Guidebook proposes that this is done through two sub-strategies: (a) Strengthening or establishing National Research and Education Networks (NRENs) that will ensure abundant and reliable digital connectivity to the door-front of the nation's higher education and TVET institutions and (b) Modernizing the campus network and digital services infrastructure of higher education and TVET institutions. Both components will include emphasis on support of indigenous human management and technical capacity at the NREN and institutional levels such that the investment in technological infrastructure is capably

managed, operated and sustained. These will support the reform of digital skills programs, the extended use of technology in teaching-learning and the management of educational institutions.

The Digital Skills Country Action Plan should establish realistic targets for connecting higher education and TVET institutions to affordable, reliable high-speed network connections to support their goals for improving Digital Skills programs and enhancing the use of technology.

The Guidebook recommends that a minimum of 100 Mbps - 1 Gbps should be available to all higher education campuses (i.e., taken as the lower bound for small higher education networks), taking into account the likely increase in data traffic and development of new applications between now and 2025. When possible, higher education institutions should obtain access to fiber for their networks and their campus backbones. In countries and higher education institutions where this is possible, fiber optic access means starting at 1Gbps, and then growing their fiber optic backbones as bandwidth requirements increase.

More detailed estimations should be undertaken at the country and institution level, and could be based on the requirements of bandwidth needed by the type of work, the information needs of students and faculty, and the types of remote facilities, shared scientific instruments and databases being accessed, such as supercomputing facilities, data analytics and visualization systems for different types of high-volume data. This is especially important to take into account when identifying the undergraduate digital skills programs (electrical engineering, computer science, mathematics etc.) to be reformed.

These benchmarks should be considered the minimum, and needs are likely to expand given the explosion in data and in digital technologies. The demarcation points for small medium and large campuses need to be adjusted based on the country's own profile. Part 2 includes guidance on how with the roll out of fiber-optic technology and new design approaches to the network infrastructure can enable enhanced bandwidth access in the future, by appropriate provisioning of fiber optics at very high bandwidths (e.g. 100 Gbps), even if current provisioning is limited to few hundred Mbps. Capacity is upgradable through changes to key elements of the infrastructure and can equally apply to the NREN's backbone or to the access network from the NREN to the campus. Hence, countries should adopt a flexible and scalable model that allows for rapid growth.

Table 6.1 Bandwidth benchmarks for different campus sizes

Type of University	Number of students*	Bandwidth Benchmark
Small campuses	<1,500	100 Mbps - 1 Gbps
Medium campuses	1,500-15,000	2 - 5 Gbps
Large campuses	>15,000	5 - 10 Gbps
Research universities		25 – 50 Gbps

Though information is not readily available, it is safe to say that very few TVET institutions have access to affordable high-speed broadband in Africa. Setting benchmarks for broadband connectivity in TVET institutions will be important.

The Country Planning Team should undertake detailed baseline assessments of connectivity in different institutions. Special attention should be paid to reduce disparities in access, especially in rural and remote regions, in order to enable students in those areas to benefit from Digital Skills training.

6.4.1 Strengthening or establishing NRENs

Over the last two decades, National Research and Education Networks (NREN) have emerged as the most effective model for provision of robust and reliable bandwidth to higher education institutions (both public and private) and interconnect them to become part of the global research and education network fabric and, in turn, establish connectivity to higher education institutions globally. The reason for creating NRENs is that the majority of internet service providers are regional (or national at best) and are normally unable to respond to the special needs of higher education institutions. Since, they constitute a very small part of the national internet-user customer base in most countries. In some countries, NRENs offer connectivity to TVET institutions and others (such as hospitals). The NRENs are then globally interconnected via regional links provided by regional REN. In Africa, connection to global networks is currently done through three regional education networks such as UbuntuNet Alliance, ASREN and WACREN. Besides, the technical embodiment of the linkages, these pioneering regional networks have provided important cross-border administrative and political models for establishing regional connectivity in Africa, which are very important lessons.

The regional and international connectivity should also be gradually diversified to match dynamic-education driven traffic patterns. Current African regional REN connectivity is routed via Europe. Still today overwhelmingly more content servers (+40% of the world's total) are in US. Asia (India, China) is rapidly increasing its higher education institutions. There are also global strategic internet hubs such as Singapore. However, there is hardly any direct connectivity between Africa and other continents. Expanding direct connectivity to other continents should be explored.

A primary focus of NRENs is to secure affordable bandwidth for higher education and other institutions, but successful NRENs also provide other related network services specific to the need of the higher education institutions such as bulk bandwidth, the ability to experiment and test new network ideas and the ability to collaborate globally.

Most African countries have NRENs, many of which are at nascent stages. The Guidebook proposes creating a plan that clearly outlines how an NREN should be established if it does not exist, how to upgrade NRENs and how to create management capacity for the organization. The establishment of a brand new NREN requires the creation of the NREN organization and commissioning of a nationwide physical broadband network infrastructure that will provide the connectivity to the higher education and TVET institutions.

Upgrading NRENs is typically done by moving away from dependence on leased bandwidth and upgrading to fiber-based links, which leads to an effective outcome. Network equipment should also be inspected and upgrading considered, recognizing that most equipment has an 8 to 10-year lifecycle. The needs of higher education and TVET institutions may also have evolved and these new needs should be considered. The growth of the higher education and TVET sectors, in terms of the number of institutions, may also drive a demand to upgrade the NREN. Upgrades should be targeted to provide more bandwidth, add more effective fiber infrastructure, expand the network to reach more parts of the country, and modernize its NREN services.

Many first-generation NRENs may also need to reassess their management capacity, improve human resource capacity to keep up with the rapid progress and demand for services to ensure high-quality services are provided.

Part 2 of the Guidebook provides specific steps to be followed by the planning process for both pathways. Both scenarios will require development of a new business plan, design of the network to provide targeted connectivity to the higher education and TVET institutions up to 2025, identifying the services to be provided, a plan for strengthening its governance and management capacity, and a capacity development plan for continuous development of its human resource and engineering capability.

6.4.2 Establishing campus network infrastructure

Without the development of campus networks and their effective management, the development of NRENs alone will not ensure availability of broadband to higher education and TVET institutions. Though there has been some progress in building NRENs, as of 2020, the campus infrastructure remains underdeveloped in most African higher education and TVET institutions, which prevents uptake in demand (and, in turn, may keep the cost of broadband high).

Modern Campus networks are much more than physical networks; they are complex enterprise which serve many digital services including digital classrooms, audio-visual communication any-time any - where, introduction and embrace of digitally enabled curriculums, access to the world of digital education resources from digital journals to digital courseware, digitally hosted courses/learning management system (LMS), and university management systems (UMS) supporting extensive enterprise wide digital automation. Upgrading campus networks is essential to bring connectivity and digital resources to the fingertips of faculty, students and researchers.

The campuses must achieve minimum standards of wireline and wireless bandwidth

availability to enable students, faculty, researchers, and staff in these institutions to access digital educational services.

Part 2 of the Guidebook provides specific steps to be followed by the planning process for both pathways. For the purpose of planning, the guideline would first group higher education and TVET campuses of a country into four categories- small, medium, large and research-intensive. The cost of IT infrastructure depends on many factors including the size of the campus, number of buildings, number of classrooms, number of students and number of staff, and the type of research and education activities they perform. This information will be used to build a template for each campus. Campuses in each category will be asked to refine the templated design for their respective institutions to develop the national compendium of campus network modernization plan.

The planning team should classify the higher education and TVET institutions of the country into these groups and identify the needs of each of these categories. They should define more concretely the characteristics of each of these categories as appropriate for the ensemble of higher education and TVET institutions in their respective countries. The planning team should identify the principal areas of investment, which typically should cover Local Area Network and campus backbone linked to the NREN and regional networks; structured campus network design; Wi-Fi which is accessible everywhere to support teaching-learning; commodity internet provision; Data Centre; High-Performance computing (where applicable); identification of management and access systems; and campus network monitoring and management systems, specific to each of these categories.

The planning team needs to identify both the uniform and special services that the campus IT must provide, a plan for strengthening the IT departments' management capacity, and a capacity development plan for the continuous development of its human resources.

The plan should also emphasize a properly staffed campus IT office with the right technical and managerial expertise, including network engineers and learning technologists; review and/or development of policies and guidelines; management of data privacy and security; management of network usage and data traffic; transfer of systems to mobile or cloud environments; unified communications and document storage; streamlining procurement and purchase of appropriate software and content for teaching and learning; provision of adequate technical support to faculty and students (for instance through a campus Help Desk).

6.5 ● Strategy 5: Capacity building and business process re-engineering in Ministries

The Digital Skills Country Action Plan cannot be implemented without a strong team in the Ministry of Education/Higher Education/TVET to provide both organizational and technical leadership, even if many of the strategies and activities of the plan will necessarily be implemented at the institution level. This team must not only have the right profile in terms of skills and competences but must also be able to work with agile processes of decision-making and implementation, consistent with the requirements of the digital economy.

The Guidebook proposes two areas under this strategy: (i) Capacity Building of Ministries and Regulatory Agencies and (ii) Business Process Re-Engineering.

Many countries have e-government strategies that may include both these areas, and it is important to ensure synergies or to include those activities in the Digital Skills Country Action Plan, in order to avoid duplication. In particular, key processes such as HR management, financial management and procurement may be re-engineered as a part of this strategy. It is important to evaluate how these changes will help to implement the Digital Skills Country Action Plan. Moreover, key educational processes such as updating and approval of curricula, assessments, certification, recognition of online courses, etc. (all key elements of the Digital Skills Country Action Plan) are not usually covered under general e-government reforms.

The "level of ambition" of the Digital Skills Country Action Plan (discussed in Section 5) will partly be determined by existing capacity constraints and the ability to bridge them. Such constraints are often more critical than financing constraints (for instance, if an external donor provides funds). If the Ministries and regulatory agencies lack critical capacities, some areas of the plan should have relatively limited targets. On the other hand, the government's desired "level of ambition", can also drive investments in capacity. If a government wishes to "aim for the sky", based on a realistic assessment of demand and resources, it should also invest heavily in creating the capacity to lead and manage the Digital Skills Country Action Plan.

In practice, it may be difficult to know what one does not know. An independent assessment of capacity needs may in this case help to supplement the initial suggestions of the planning team, and could be included in the Digital Skills Country Action Plan.

6.5.1 Capacity Building of Ministries and Regulatory Agencies

The concerned Ministries as well as key regulatory agencies should be included in the plan. Examples of the latter are the Higher Education Authority, the TVET/Skills Authority and Quality Assurance agencies.

The Guidebook proposes that that the following areas be considered:

- Staffing profile: Design, review and implementation of the Digital Skills Country Action Plan will require digital planners, who have a working knowledge of technology, but are highly skilled in managing projects and people; technical experts, who provide leadership in specific domains in the plan (for instance the broad strategies and important cross-cutting themes like cybersecurity), due to their deep knowledge and expertise; middle level managers, who are responsible for implementing key activities and who should have a working-level knowledge of digital skills; and operational and administrative staff, who require intermediate to basic level of digital skills, particularly in using digital tools. A mapping of the staff roles with digital skills requirements should be undertaken.

- Expertise required during phases of the plan: it is crucial to recognise that in the digital plan, the three aspects of design, implementation and review should be considered at the same time. For instance, as the implementation is occurring, design, and re-design of the digital plan must continue to happen. Also, as the digital plan is being designed, the review aspect must be an essential component in the formulation, rather than an afterthought. Skills and expertise required during design include people capable of doing horizon scan and future-casting, as well as those who are operational and pragmatic in designing plans. The implementation stage requires both subject matter experts and the translational experts who focus on translating research knowledge and ideas into a practicable suite of process and products. In the review aspect, the expertise needed included include both people with assessment skills, as well as strong facilitators.

- Modalities for Capacity Building: The two basic options are use of external expertise (recommended for one-off tasks or where outsourced expertise is cheaper) or developing in-house capacity (where nuanced understanding of the institutional context is critical and for recurring tasks). Management of external expertise and transfer of knowledge is important if the first option is to help build capacity. For the second option, the plan should consider the feasibility of strategic hiring (including from the private sector and highly skilled African diaspora, who could be brought in for a period of five years at the Ministry level to help build the capacity of Ministries) and professional development (through training, mentoring, attachments).

- Staff retention: Digitally skilled public servants can be attracted by higher wages in the private sector, due to the shortages of these skills. Hence, capacity building should be linked with policies and strategies for staff retention like developing a sense of mission and providing professional development, conducive work culture and a fair and competitive renumeration.

6.5.2 Business process engineering

Business Process Re-engineering involves a review and refinement of existing work processes so as to be more efficient and effective in delivering the business output and outcomes. Business processes are categorized by operational processes, management processes and support processes. Operational processes are central to the execution of the tasks of the organisation. Examples of specific operational processes could include the deployment of certain goods and services to the stakeholders. Management processes relate to the supervisory function of the management and could include processes for the planning & deployment, budgetary supervision, and the monitoring and evaluation of programmes. Support processes enable the smooth implementation of operational processes. Examples of support processes include corporate services, such as finance, human resources, administrative and technical support.

Examples of business process reengineering could include the setting up of standards and specifications for institutional accreditation process and periodic quality checks in the aspect of technical infrastructure, procurement specifications, organizational structures and staffing qualifications. Such standards and specifications may, in time, build a maturity model that tertiary educational institutions can benchmark themselves against. One such set of standards could be having the ministries define a reference enterprise architecture that includes technology architecture, application architecture, data architecture, and business architecture. The setting up of enterprise architecture helps to connect between process management and data management with the underlying applications and technological infrastructure.

Re-engineering business processes is a complex task and involves a high level of stakeholder consultation and communication of the changes. The Guidebook proposes that the country planning team prioritizes those processes that are critical to the success of the Digital Skills Country Action Plan, especially those that do not correspond to the needs of the digital world.

For each business process identified, the Action Plan can: propose ways in which the process can be improved; review the impact of the change on stakeholders; highlight the benefits from re-engineering the process; assess and mitigate the risks from the change in the business process; develop instruments to measure the improvements or impacts of the changes.

7 Costing of the Digital Skills Country Action Plan - Web Based Costing Tool

Implementation of the Digital Skills Country Action Plan will require a range of resources under each Strategy, such as physical infrastructure, ICT infrastructure, human resources, ongoing professional development, learning platforms, Digital Learning Resources, equipment, services, and materials. The costing of the Plan is crucial to determine the internal resources needed to implement the Plan and estimate the financing gap between the amount of resources available and required. Accurate costing of Digital Skills Country Action Plans would allow governments to understand whether the set targets are realistic and achievable, prioritize their goals and objectives and to determine what is feasible within the given timeframe. It also allows line Ministries to request budgets for the proposed programs and activities from their Ministries of Finance, or from donors and development partners.

A Digital Skills Country Action Plan without costs can only be a statement of intent. Many problems in implementation of existing strategies are associated with a lack of linkages between intended goals and budget allocations, serious under-estimation of capital and especially recurrent expenditures. By preparing a costed plan, broad policy objectives can be translated into activities and targets by year, the resources needed for implementation can be quantified, and related costs can be estimated, allowing in turn assessment of feasibility, affordability, and efficiency. Approval of a costed plan at a high level in the government and efforts to secure the required resources signals the commitment of the Government to achieve the objectives and goals of the plan.

Costing is an iterative process, and each round of the iteration ideally serves a different purpose. The cost estimation should be integral to the overall planning process. An initial scoping analysis gathers information on likely trends in available financing and fiscal policy "ceilings" over the planning period, along with planned reforms. Scenarios on costs are presented and discussed through a series of consultations, including data validation processes with technical counterparts. Presenting cost data compared with estimated financing projections informs discussions on priority-setting as needed. The final detailed costing will be done when the detailed programs and activities have been finalized and approved. The key features of each step in the iteration are indicated in Table 7.1.

Even the final cost estimates should not be interpreted as fixed resource needs but rather as an initial projection of resources needed, acknowledging that the environment is dynamic with a certain level of uncertainty and where best practice strategies and prices of goods and services continuously evolve. The cost of the Plan should be regularly updated as the plan, goals and targets are monitored during implementation, strategies are changed, and because of changes in the cost of inputs. Multi-year cost projections are continuously updated as required in a dynamic planning environment and linked to mid-term reviews and annual plans.

Capacity building in the area of costing and budgeting, especially in a rapidly changing technological environment, should be included as part of the Digital Skills Country Action Plan.

While country planning teams can develop their own tools for costing the Plan, a web-based tool could help countries to easily input data, generate tables and graphs, and do comparative analysis of multiple options to decide on the detailed activi-

ties under each strategy. Country Planning Teams can use an interactive web-based costing tool customized for the Digital Skills Country Action Plan, developed by the Global E-Schools and Communities Initiative (GESCI)[1].

An important aspect of web-based costing tool is that it helps to estimate the Total Cost of Ownership (TCO) or operation of technology. The tool captures all the expenses associated with capital and recurring expenses for various options and provides a consolidated summary in the form of tables and graphs for the educational planners and policy implementers. Key parameters that can be entered include: number of institutions by size, different types of technologies for teaching-learning; the roll-out plan; unit costs or prices etc.

As part of the customization, the web-based costing tool allows entry of data for the 5 major strategies and for the sub-strategies under different cost headings. The tool estimates the recurrent and capital annual costs. The summary report of each strategy can be exported into excel form for final consolidation into Country Action Plan. As decision makers review the cost of the plan, further iterations and adjustments can be made, to keep within the anticipated resource envelope. The use of a common tool also allows countries to compare the cost of each other's Plans.

More details are available in Part 2 of the Guidebook.

Table 7.1 outlines the stages in the development of the Action Plan and costing estimates, starting with the high level cost estimates for Scenario Planning (Section 5) to the more detailed cost estimates using the web-based costing tool.

1 The Global e-Schools and Communities Initiative (GESCI) is an international non-profit organisation founded in 2003 on the recommendation of the United Nations Task Force on Information Communication Technology (ICT). They work with governments and partners in providing strategic support to develop and implement models of good ICT-based practice for high-quality education & training and to build effective leadership abilities in ICT and Knowledge Society development among Government officials across the developing world. GESCI has partnered with the World Bank on the Digital Skills Country Action Plan initiative to provide a customised tool that will be used by Country Planning Teams to carry out detailed costing exercises.

Table 7.1 Stages of Action Plan Development and Costing

	At what stage	Output	Audience/Purpose	Remarks
Stage 1 Costing #1	First draft action plan with high level goals, targets and broad strategies and activities for 3 "levels of ambition"[1]	Aggregate annual high-level cost estimates for the 3 "levels of ambition", showing breakdown by capital and recurrent expenditures and for each of the five strategies. Output will explain key assumptions behind the estimates. Comparison with existing and potential/expected financial resources	Minister and/ or approving authority approves the appropriate "level of ambition" of the plan, considering resource requirements, affordability, the realism of filling the financing gap, and implementation capacity constraints	The "level of ambition" and broad resource envelope sets the framework for the next stage of planning, where the working groups decide on the goals for each strategy
Stage 2 Costing #2	Second draft action plan, with approved "level of ambition" for high level goals, and more detailed actions for each of the five strategies	More detailed annual cost estimate at aggregate level and by strategy and activity (capital and recurrent). Summary tables and per student/ beneficiary cost estimates and unit costs to assess efficiency	Country Planning Team Evaluates trade-offs between strategies and activities to keep within agreed envelope; assesses whether costs are reasonable and adequately estimated, including total cost of operation of technologies, infrastructure etc.; assesses whether operational costs and capacity building costs are funded; assesses main cost drivers and whether cost-effective solutions can be found for reducing costs	The Country Planning Team will propose adjustments to the plan goals and targets, as well as the specific strategies. If there are important decisions, these may need to be referred to the Minister or other approving authority
Stage 3 Costing #3	Third draft action plan considering adjustments of Phase 2 to strategies and activities	Revised, annual detailed cost estimate at aggregate level and by strategy and activity (capital and recurrent)	Country Planning team evaluates the accuracy of the cost estimates	Country Planning team submits costed action plan for approval
Stage 4	Final costed Digital Skills Country Action Plan			

1 Levels of ambition shall be projected under different scenarios of growth, e.g., 'minimum', 'average', 'ambitious'.

Appendix

Appendix 1: Prework for Digital Skills Country Action Plan Workshop

Section 1: Assessing Demand of Digital Skills

An assessment of the current and prospective demand for Digital Skills is essential to setting realistic targets for the Digital Skills Country Action Plan. Table 1(A) and Table 1(B) present templates for collecting and synthesizing information about digital skills demand from the principal use sectors like Government, Health, Education, and Banking and ICT sectors respectively.

Table 1(A) and Table 1(B) outlines a set of demand-related information which the countries should collect from a variety of sectors. Some of this information is directly related to current and projected demand, whereas some utilizes proxy measures to estimate demand. In absence of data, 'best-guess estimates' including those informed by discussions with experts in the field are good substitutes for exact information.

Note for reader

Section 4.1 - The Demand for Digital Skills provides an overview of what is the value and the usefulness of demand forecasting for Digital Skills. Please review before completing Tables 1(A) and 1(B). Please refer to Section 3.4 - Understanding the Range of Digital Skills for specific information on Digital Skills Frameworks.

Table 1(A): Indicators of Demand for Digital Skills from Principal Use Sectors (Jobs and Users)

Key Use Sectors	Indicators of demand for digital skills			Potential to expand in next 5 years	Types of digital skills that will be required	Source
	Area	Specify whether users, jobs or number of service providers	Number of users, number of jobs/ number of service provider	(Very likely, somewhat likely, not likely)	(Indicate which of the four proficiency levels from the Digital Skills Framework - Basic, Intermediate, Advanced, Highly Specialized)	
Government	e-Government services	Users				
	Government jobs requiring advanced or highly proficient digital skills. This includes all levels of the government including local and city governments.	Jobs				
	Public enterprise jobs requiring advanced or highly proficient digital skills. This includes all pubic services such as police, utilities (water, electricity, waste, roads etc.) as well as state-owned enterprises.	Users				
Telecommunications	Smart phones	Users				
	Mobile Internet	Users				
	Current number of employees at mobile phone providers	Jobs				
	Current number of mobile money accounts	Users				
	Fixed Internet	Users				
Agriculture	Number of farmers implementing smart irrigation technology.	Users				
	Number of active/usable tractors in-country	Service provider				
	Number of food processing or food storage companies in-country	Service provider				
	Numbers of companies offering drone surveying of agricultural land.	Service provider				

Section 1: Assessing Demand of Digital Skills

Table 1(A) Continued
(2 of 3)

Table 1(A): Indicators of Demand for Digital Skills from Principal Use Sectors (Jobs and Users)

Key Use Sectors	Indicators of demand for digital skills			Potential to expand in next 5 years	Types of digital skills that will be required	Source
	Area	Specify whether users, jobs or number of service providers	Number of users, number of jobs/ number of service provider	(Very likely, somewhat likely, not likely)	(Indicate which of the four proficiency levels from the Digital Skills Framework - Basic, Intermediate, Advanced, Highly Specialized)	
Healthcare	Number of active MRI or CT scan machines for use in-country.	Service provider				
	Jobs requiring digital skills in the areas of health administration including electronic health management systems.	Jobs				
Education	Number of installed laptops and tablets in schools in country	Service provider				
	Jobs requiring digital skills - teaching	Jobs				
	Jobs requiring digital skills - education administration	Jobs				
Banking	Jobs requiring digital skills	Jobs				
	Number of users of banking services	Service provider				
	Number of insurance companies operating in-country	Service provider				
	Mobile-banking	Users				
	Number of international cities reachable via a direct flight from the capital city	Service provider				

Section 1: Assessing Demand of Digital Skills

Table 1(A) Continued
(3 of 3)

Table 1(A): Indicators of Demand for Digital Skills from Principal Use Sectors (Jobs and Users)

Key Use Sectors	Indicators of demand for digital skills			Potential to expand in next 5 years	Types of digital skills that will be required	Source
	Area	Specify whether users, jobs or number of service providers	Number of users, number of jobs/ number of service provider	(Very likely, somewhat likely, not likely)	(Indicate which of the four proficiency levels from the Digital Skills Framework - Basic, Intermediate, Advanced, Highly Specialized)	
Transport and Logistics	Annual volume of containers (if there is a port)	Service provider				
	Number of active drivers in-country on Uber and all Uber-style shared mobility platforms	Jobs				
E-commerce	Number of delivery persons operating in-country	Service provider				
Business Process Outsourcing (BPO)	Number of jobs in the BPO field	Jobs				
Media and entertainment	Number of jobs at radio and TV broadcasters operating at the national and state/provincial level	Jobs				
Construction	Number of jobs requiring advanced or highly specialized digital skills	Jobs				
Services	Number of jobs requiring advanced or highly specialized digital skills	Jobs				
Manufacturing	Number of jobs requiring advanced or highly specialized digital skills	Jobs				

Section 1: Assessing Demand of Digital Skills

Table 1(B)

Table 1(B): Indicators of demand for digital skills in ICT and Telecommunications Industries

Sector	Sub-sector	Current number of jobs	Potential to expand in next 5 years (Very likely, somewhat likely, not likely)					Source
			Technician	Professional	Senior professional	Advanced	Highly specialized	
ICT	Software development							
	Hardware							
	(Add others)							
Telecomms	Mobile towers							
	Fibre optic networks							
	(Add others)							

Section 2: Assessing Supply of Digital Skills

Assessing the current state of provision of Digital Skills education and training is important to establish a baseline for the Digital Skills Country Act

ion Plan. This will determine what is feasible in terms of targets and to assess which modes of provision should be expanded. Table 2 provides a template to consolidate information about digital skills provision at various skill levels. Information for this table can be found on the websites of Ministry of Higher Education/TVET.

Note for reader

Section 4.2- Assessment of the Supply of Digital Skills provides an overview of how to assess the supply of Digital Skills with useful background information. Please review before completing Table 2.

Table 2: Institutions offering Digital Skills courses		**Public**	**Private**	**Total**	**Source**
Intermediate level Digital Skills					
TVET Institutions offering relevant courses in Digital Technologies (ISCED Level 4) [Certificate/Diploma courses]					
Number of TVET institutions offering relevant courses in digital technologies					
Number of courses in digital technologies in above institutions (offline/in-person)					
Student enrollment in these courses (offline)					
Number of courses in digital technologies in above institutions (online)					
Student enrollment in these courses (online)					
Number of graduates from these courses					
Non-University Tertiary Education Institutions offering relevant courses in Digital Technologies (ISCED Level 5)					
Number of Non-University Tertiary Education Institutions offering relevant courses in digital technologies					
Number of courses in digital technologies in above institutions (offline/in-person)					
Student enrollment in these courses (offline)					
Number of courses in digital technologies in above institutions (online)					
Student enrollment in these courses (online)					
Number of graduates from these courses					

Section 2: Assessing Supply of Digital Skills

Table 2 Continued
(2 of 4)

Table 2: Institutions offering Digital Skills courses		Public	Private	Total	Source
Intermediate level Digital Skills (Continued)					
Higher Education Institutions (Universities) offering relevant courses in Digital Technologies (ISCED Level 6) [Undergraduate courses in disciplines not related to Engineering, Math, and Science]					
Number of Higher Education Institutions (Universities) offering relevant courses in digital technologies					
Number of courses in digital technologies in above institutions (offline/in-person)					
Student enrollment in these courses (offline)					
Number of courses in digital technologies in above institutions (online)					
Student enrollment in these courses (online)					
Number of graduates from these courses					
Advanced level Digital Skills					
Higher Education Institutions (Universities) offering relevant courses in Digital Technologies (ISCED Level 6) Electrical Engineering, and related disciplines]					
Number of Higher Education Institutions (Universities) offering relevant courses in digital technologies					
Number of courses in digital technologies in above institutions (offline/in-person)					
Student enrollment in these courses (offline)					
Number of courses in digital technologies in above institutions (online)					
Student enrollment in these courses (online)					
Number of graduates from these courses					

Section 2: Assessing Supply of Digital Skills

Table 2 Continued
(3 of 4)

Table 2: Institutions offering Digital Skills courses		Public	Private	Total	Source
Advanced level Digital Skills (Continued)					
Higher Education Institutions (Universities) offering relevant courses in Digital Technologies (ISCED Level 6) [Undergraduate courses in other engineering disciplines]					
Number of Higher Education Institutions (Universities) offering relevant courses in digital technologies					
Number of courses in digital technologies in above institutions (offline/in-person)					
Student enrollment in these courses (offline)					
Number of courses in digital technologies in above institutions (online)					
Student enrollment in these courses (online)					
Number of graduates from these courses					
Higher Education Institutions (Universities) offering relevant courses in Digital Technologies (ISCED Level 6) [Undergraduate courses in Math, Science, and other related disciplines]					
Number of Higher Education Institutions (Universities) offering relevant courses in digital technologies					
Number of courses in digital technologies in above institutions (offline/in-person)					
Student enrollment in these courses (offline)					
Number of courses in digital technologies in above institutions (online)					
Student enrollment in these courses (online)					
Number of graduates from these courses					

Section 2: Assessing Supply of Digital Skills

Table 2 Continued
(4 of 4)

Table 2: Institutions offering Digital Skills courses		Public	Private	Total	Source
Highly Specialized level Digital Skills					
Higher Education Institutions (Universities) offering relevant courses in Digital Technologies (ISCED Level 7-8) [Postgraduate courses in Computer Science, Electrical Engineering, other engineering, Math, and Science related disciplines]					
Number of Higher Education Institutions (Universities) offering relevant courses in digital technologies					
Number of courses in digital technologies in above institutions (offline/in-person)					
Student enrollment in these courses (offline)					
Number of courses in digital technologies in above institutions (online)					
Student enrollment in these courses (online)					
Number of graduates from these courses					

Section 3: Digital Skills Policies

National policies, strategies, regulations and standards will affect the extent to which Digital Skills programs can be reformed, the use of technology in teaching and learning and the spread of broadband connectivity. In Table 3, please list policies (including draft policies) undertaken by the government focused on developing digital skills of students at the higher education/ TVET level and related issues of digital infrastructure, cybersecurity, etc. A suggestive list of themes has been provided in the table.

Note for reader

Section 6.1 - Establishing policies and regulatory frameworks an overview of various relevant policies and policies themes that must be considered by the Country Planning Team. Please review before completing Table 3.

Table 3: List of relevant policies

Policy Theme	Ministry	Name of the Policy	Year of document	Link to document
Digital Skills Development in Higher education				
Digital Skills development in TVET				
NREN policy				
ICT/Broadband Strategy				
Universal Access Funds				
Taxtion policy (provisions for the use of IT equipment in the education sector)				
Digital Payments				
Cross Border Use of Data				
Intellectual Property (regarding online content)				
Data Protection and Privacy				
Cybersecurity				
Artificial Intelligence				
Procurement Policy & HR Policy for recruitment of Digital Talent				
Grading Policies				
(please add other theme)				

Section 4: TVET and Higher Education Country Context

In addition to assessing the current supply of digital skills, it is important to understand the TVET and higher education context while developing Digital Skills Country Action Plan. Table 4 provides a template for collecting relevant information about the number of institutions, enrollment, staff, etc. at various education levels. Information to fill this table might be available on the Ministry of Higher Education/ TVET website, strategic plans, and policy documents. External sources like UNESCO Institute of Statistics website might also be helpful.

Note for reader

Section 6.1 - Establishing policies and regulatory frameworks an overview of various relevant policies and policies themes that must be considered by the Country Planning Team. Please review before completing Table 3.

Table 4: Data on TVET and Higher Education	Baseline	Source
Number of students in TVET (ISCED level 4)		
TVET Gross Enrollment Ratio		
Total number of TVET institutions		
Total number of teaching staff		
Total number of non-teaching staff		
Number of students in non-university tertiary (ISCED level 5)		
Non-university tertiary Gross Enrollment Ratio		
Total number of non-univeristy tertiary institutions		
Total number of teaching staff		
Total number of non-teaching staff		
Number of undergraduate students in universities (ISCED level 6)		
Higher Education (undergraduate) Gross Enrolment Ratio		
Total number of Universities		
Total number of teaching staff		
Total number of non-teaching staff		
Total population		
Population annual growth (percent)		
Please estimate the % of institutions (at ISCED level 4, 5, and 6) offering intermediate level digital skills training		
Please estimate the % of enrolled students in the above institutions that acquire intermediate level skills		

Section 5: Baseline Costs and Estimated Costs

In order to develop a costed Digital Skills Country Action Plan it is necessary to analyze current cost of delivery and estimate costs of future program delivery at various levels. Table 5 provides a template for collecting current actual and estimated program delivery costs (both capital and recurrent costs).

Note for reader

Section 7 - Costing of the Digital Skills Country Action Plan provides an overview the costing process to determine the resources needed to implement the Digital Skills Country Action Plan. Please review before completing Table 5.

Table 5: Baseline Costs and Estimated Costs

TVET level (Existing courses)		**Intermediate level digital skills program**			**Source**
Current annual recurrent cost of course delivery per student, USD per year (for general programs related to all professions)					
Current annual recurrent cost of course delivery per student, USD per year (specifically related to ICT professions)					
TVET level (Estimates for new and updated courses)		**Intermediate level digital skills program**			**Source**
Your estimate of Capital cost of course development (including cost of devices and infrastructure), for general digital skills program related to all professions (USD per program)					
Your estimate of Capital cost of developing a fully new program (including cost of devices and infrastructure), for delivering digital skills program related to ICT professions (USD per program)					
Your estimate of Capital cost of program update (upgrading current program to a higher quality program) including upgading curriculum, labs, equipment, infrastructure (USD per program)					
Your estimate of annual recurrent cost of course delivery per student, USD per year (for new/updated programs)					
Undergraduate University Level (Existing courses)		**Computer Science & Electrical Engineering Programs**	**Other Engineering programs**	**Math and Science programs**	**Source**
Current average recurrent cost of course delivery per student, USD per year					
Undergraduate University Level (Estimates for new and updated courses)		**Computer Science & Electrical Engineering Programs**	**Other Engineering programs**	**Math and Science programs**	**Source**
Your estimate of Capital cost of developing a fully new program (including cost of devices and infrastructure), USD per program					
Your estimate of Capital cost of program update (upgrading current program to a higher quality program) including upgading curriculum, labs, equipment, infrastructure, USD per program					
Your estimate of annual recurrent cost of course delivery per student, USD per year (for new/updated programs)					

Section 5: Baseline Costs and Estimated Costs

Table 5 Continued
(2 of 3)

Table 5: Baseline Costs and Estimated Costs

Postgraduate University Level (Existing courses)		**Computer Science & Electrical Engineering Programs**	**Other Engineering programs**	**Math and Science programs**	**Source**	
Current average recurrent cost of course delivery per student, USD per year						
Postgraduate University Level (Estimates for new and updated courses)		**Computer Science & Electrical Engineering Programs**	**Other Engineering programs**	**Math and Science programs**		
Your estimate of Capital cost of developing a fully new program (including cost of devices and infrastructure), USD per program						
Your estimate of Capital cost of program update (upgrading current program to a higher quality program) including upgading curriculum, labs, equipment, infrastructure, USD per program						
Your estimate of annual recurrent cost of course delivery per student, USD per year (for new/updated programs)						
Your estimate of purchasing online software		**Capital cost per user**	**Recurrent cost per user**	**Number of Users**	**Relevant for TVET/ Undergraduate/ Both**	Source
(Insert Software Name 1)						
(Insert Software Name 2)						
(Insert Software Name 3)						
(Insert Software Name 4)						
Estimate cost of connecting universities and TVET institutions to high speed broadband		**Small Campuses**	**Medium Campuses**	**Large Campuses**	**Research Institutions**	**Source**
Capital costs (per campus, per year) (e.g., last mile connectivity, costs campus network fibre, equipment)						
Operating costs (per campus, per year) (e.g., personnel cost, office expenditure, bandwidth cost)						

Section 5: Baseline Costs and Estimated Costs

Table 5 Continued
(3 of 3)

Table 5: Baseline Costs and Estimated Costs

Estimate cost of connecting universities and TVET institutions to high speed broadband		**Small Campuses**	**Medium Campuses**	**Large Campuses**	**Research Institutions**	**Source**
Capital costs (per campus, per year) (e.g., last mile connectivity, costs campus network fibre, equipment)						
Operating costs (per campus, per year) (e.g., personnel cost, office expenditure, bandwidth cost)						
Estimate cost of campus infrastructure, equipment and operations (including management capacity)		**Small Campuses**	**Medium Campuses**	**Large Campuses**	**Research Institutions**	**Source**
Capital costs (per campus, per year)						
Operating costs (per campus, per year)						
Current cost of training staff in digital skill (intermediate level)						
Current cost of training staff in digital skill (specialised skills)						

Appendix

Appendix 2: Process Documents

Section 1

Section 1: Terms of Reference - Country Planning Team

The Digital Skills Country Action Plan process aims to support countries in the rapid development Digital Skills amongst young people through coordinated strategies on several fronts. This is a follow up to the conclusions of the 5th Forum of the Partnership for Skills in Applied Sciences, Engineering and Technology (PASET) in May 2019 under the theme of Destination Digital Africa: Preparing our Youth for the Future and as part of the World Bank led Digital Economy for Africa initiative, which supports the Digital Transformation Strategy of the African Union.

The Digital Skills Country Action Plan foresees the process being led in country by a Country Planning Team. Appointed by the Minister or higher level authority, the Country Planning Team provides oversight to and is supported by the Working Groups in different strategic areas, and in the area of costing. If the Action Plan is approved and implemented, the Country Planning Team will become the core of the Digital Skills implementation unit.

Overall Role

The main outcome of the preparation phase is to prepare a high quality Digital Skills Country Action Plan. The main function of the Country Planning Team is to lead and review the work of the Working Groups, ensure that the outputs of these Working Groups are synchronized and coordinated, and that different tasks are completed on time

Reporting Lines

The Country Planning Team will report to the Minister or higher level authority.

Responsibilities

- Giving guidance to the Working Groups as necessary, including ensuring key interdependencies between strategies, use of the Guidebook, tools and templates
- Planning the detailed process of preparing the Action Plan along with the Working Groups and monitoring deadlines
- Identifying and helping to take the key decisions to be taken, including resolving issues related to data collection
- Recommending the 'Level of Ambition' to the Minister and helping to take informed decisions
- Reviewing the outputs of the Working Groups (drafts of different strategies) and ensuring their coherence and internal consistency
- Reviewing the costing of the Action Plan, and making adjustments to strategies to arrive at reasonable costs
- Reviewing the draft Action Plan before submitting for approval to the Minister
- Interacting with the World Bank technical assistance team at regular intervals

Team Composition

Head of the Country Planning Team, who will also oversee the Secretariat

Heads of the Working Groups on the 5 strategies and on costs

Section 2

Section 2: Terms of Reference - Working Groups on Strategic Areas and on Costing

The Digital Skills Country Action Plan process aims to support countries in the rapid development Digital Skills amongst young people through coordinated strategies on several fronts. This is a follow up to the conclusions of the 5th Forum of the Partnership for Skills in Applied Sciences, Engineering and Technology (PASET) in May 2019 under the theme of Destination Digital Africa: Preparing our Youth for the Future and as part of the World Bank led Digital Economy for Africa initiative, which supports the Digital Transformation Strategy of the African Union.

The Digital Skills Country Action Plan is expected to be prepared by a Country Planning Team with support from a set of Working Groups which will take the lead on the technical design, costing and overseeing the implementation of each of the five working areas, which are:

- Establish enabling policies and develop Digital Skills framework
- Reform of Digital Skills education and training program
- Enhance use of technologies in teaching and learning
- Connect higher education and TVET institutions to affordable high-speed broadband
- Capacity building and business process re-engineering in Ministries

Overall Role

The main outcome of the preparation phase is to prepare a high quality Digital Skills Country Action Plan. The Working Groups in the 5 strategic areas will prepare the relevant section of the plan, with goals, targets, detailed activities, implementation plan and monitoring indicators. The Working Groups will prepare drafts that will undergo several iterations, as they are reviewed by the Country Planning Team for ensuring consistency and coordination.

The Working Group on Costing will work with the different Working Groups to collect information and suggest changes based on cost estimates. It will also use the web-based costing tool and input the data supplied by the Working Groups. It will prepare tables and outputs for the Country Planning Team to take decisions.

Working Groups on Strategic Areas

Reporting Lines

Each Working Group will report to the Lead of the Working Group, who will form part of the Country Planning Team.

Responsibilities

- Use the guidebook , tools and templates to prepare the Digital Skills Country Action Plan
- Prepare the draft of the goals, detailed activities, implementation plans and monitoring indicators
- Provide data to the Costing Working Group to generate costs
- Undertake iterations under the guidance of the Country Planning team and based on cost estimates
- Develop a costed Action Plan

Working Group on Costing

Reporting Lines

The Working Group on Costing will report to the Country Planning Team or its Head

Responsibilities

- Understand the web-based costing tool and work closely with the technical assistance firm to input data and get technical support
- Provide guidance to the Working Groups on the data required to generate costs (physical units, physical quantities, unit costs, capital and recurrent costs). In particular, understanding the total cost of using technology is critical in giving this guidance
- Prepare cost estimates of the different strategies at various stages to provide feedback to Working groups on the their draft plans
- Prepare key tables and graphs for the Country Planning Team to take decisions
- Prepare the costing of the Action Plan

Composition

The team can comprise 2 people. It is proposed that they consist of economists and/or technical persons with understanding of costs. (People from the planning or budget team can also be considered) Strong quantitative skills with an eye for detail and the ability to create easily understood tables and charts are required.

Section 3

Section 3: Terms of Reference - Secretariat (preparation phase)

The Digital Skills Country Action Plan process aims to support countries in the rapid development Digital Skills amongst young people through coordinated strategies on several fronts. This is a follow up to the conclusions of the 5th Forum of the Partnership for Skills in Applied Sciences, Engineering and Technology (PASET) in May 2019 under the theme of Destination Digital Africa: Preparing our Youth for the Future and as part of the World Bank led Digital Economy for Africa initiative, which supports the Digital Transformation Strategy of the African Union.

Preparation of the Digital Skills Country Action Plan involves multiple teams and the task will be facilitated if there is a small Secretariat to support the Country Planning Team. If the Action Plan is approved and implemented, the secretariat can be enlarged and hired to oversee the monitoring and implementation of the Plan.

Overall Role

The main outcome of the preparation phase is to prepare a high quality Digital Skills Country Action Plan. The Secretariat's main function at this time is to support the Country Planning Team and various Working Groups in the task of collecting and sharing information, ensuring that there is adequate coordination, and that different tasks are completed on time

Reporting Lines

The Secretariat will report directly to the Head of the Country Planning Team.

Responsibilities

- Collecting information requested as part of the preparation phase
- Completing the 'Levels of Ambition' costing tool and other templates
- Coordinating and communication: Assisting the Head of the Country Planning Team to coordinate and communicate with the Working Groups (including calling meetings) and be the point of contact for the World Bank technical assistance team for logistical matters and information
- Drafting short notes and PPTs: Assist the Head materials to present to decision makers, minutes of key meetings etc

Team Composition

1-2 full-time persons expected to be sufficient, with support from other experts

Suggest a senior technical expert (or combination of senior expert and junior person) in the Ministry of Higher Education/ Education or relevant education authorities or Ministry of ICT, who are or have:

- Well organized and capable of planning ahead and monitoring milestones
- Ability to collect and assess data and use MS Excel
- Good writing abilities
- Ability to work with multiple teams, follow up as necessary
- Strong overall knowledge of the national education system including the higher education and TVET landscape
- Network of contacts with other Ministries in-country

Section 4

Section 4: Composition of Country Planning Teams

Core Team

Role	Proposed Names
Chair of the Core Team	
Leader of Working Group: Strategy 1	
Leader of Working Group: Strategy 2	
Leader of Working Group: Strategy 3	
Leader of Working Group: Strategy 4	
Leader of Working Group: Strategy 5	
Leader of Working Group: Overall Costing	

Strategy

Strategy 1: Establish Enabling Policies and Develop Digital Skills Framework

	Profile	Proposed Names
Working Group Leader	Person familiar with ICT policies in Education/ Higher Education	
Working Group Team Member 1	Senior person from Ministry in charge of ICT or ICT Authority	
Working Group Team Member 2	Senior person from Qualifications Authority (who can deal with Skills Framework, and how to incorporate digital skills)	
Working Group Team Member 3		
Working Group Team Member 4		
Working Group Team Member 5		

Strategy 2: Reform of Digital Skills Program

	Profile	Proposed Names
Working Group Leader	Head of Faculty of Electrical Engineering/ Computer Science in leading university (or former head) Is considered a leader in the area, but also has a vision and can work on TVET issues	
Working Group Team Member 1	Representative of dept of electrical engineering/ computer science or related fields from medium size university	
Working Group Team Member 2	Representative of dept of electrical engineering/ computer science or related fields from small, rural university	
Working Group Team Member 3	Representative of TVET sector, familiar with critical technology courses	
Working Group Team Member 4	Representative of TVET sector, familiar with critical technology courses	
Working Group Team Member 5	Representation of private sector to provide insights into future demand	

Strategy 3: Enhance Use of Technologies in Teaching and Learning

	Profile	Proposed Names
Working Group Leader	ICT leader at the Ministry level (e.g., Director of NREN or Minister advisor for ICTs) • understands technology implementation demands and challenges in higher education, including priorities, outcomes, programs and tools • understanding extends beyond technology to impact on teaching and learning	
Working Group Team Member 1	ICT leader with strong background in instruction at the university level (e.g., Minister Advisor) • understands university organizational structure, roles, priorities, power dynamics across the universities and at the ministry	
Working Group Team Member 2	Higher education leader at the national level (e.g., National Director of Higher Education) • understands country's education policies and has ability to affect/ change policy • understands current context of technology use and challenges in higher education setting	
Working Group Team Member 3	Distance education leader at the national level (e.g.,) • understands country's distance education program and has ability to affect/ change policy and program • understands current technology use and challenges in context of distance education • could also be someone who has interest in improving teacher training programs and how to introduce digital skills in those programs	
Working Group Team Member 4	TVET leader at the national level (e.g., National Director of TVET) • understand country's TVET policies and has ability to affect/change policy • understands current context of technology use and challenges in TVET setting	
Working Group Team Member 5	Coordinator of the development of the technology plan for education • understands key stakeholders and processes in coordinating work between NREN and appropriate departments of Ministry of Education	
Working Group Team Member 6	University-level ICT and Education leader (Informatics Center Director) • understands technology demands from instruction and ICT perspectives • experienced in large-scale technology implementation at university level across multiple campuses	

Strategy 4: Connect Higher Education and TVET Institutions to affordable high-speed broadband

	Profile	Proposed Names
Working Group Leader	Person who understands NREN, network infrastructure, campus infrastructure and issues related to introducing technology and can work with ICT authority	
Working Group Team Member 1	Senior person from Ministry responsible for ICTs and for rolling out broadband strategy	
Working Group Team Member 2	ICT Director of large public university Has vision of working with university staff to integrate technology	
Working Group Team Member 3	ICT Director of medium size public university	
Working Group Team Member 3	ICT Director of small size public/ private university	
Working Group Team Member 4	ICT Director or staff from a premier TVET institution	
Working Group Team Member 5	ICT Director or staff from an average TVET institution	

Strategy 5: Capacity Building and Business Process Re-engineering

Working Group Leader	Senior Official (higher than Director) in the Ministry that looks after Staff Training and Deployment	
Working Group Team Member 1	Organisational Development Director in Ministry (or equivalent)	
Working Group Team Member 2	Staff Training and Development Director (or equivalent)	
Working Group Team Member 3	Human Resources Director (or equivalent)	
Working Group Team Member 4	University and TVETs Rector or leaders/Deans	
Working Group Team Member 5	Higher Education Advisory or Regulatory Authority Representative	
Working Group Team Member 6	TVET Regulatory Authority Representative	

Overall Costing of Digital Skills Country Action Plan

	Profile	Proposed Names
Working Group Leader	Director of Planning or related field Senior person who has access to and understand education statistics required for the plan, understands Excel models and can understand the needs of the other Working Groups for data	
Working Group Team Member 1	Senior person with knowledge of and access to education statistics	
Working Group Team Member 2	Senior person with knowledge of costing, who can be trained on using the web-based costing tool and the spreadsheet costing template	
Working Group Team Member 3	Assistant to senior person with knowledge of costing, who can be trained on using the web-based costing tool and the spreadsheet costing template	
Working Group Team Member 4	Budget person from Ministry of Finance	
Working Group Team Member 5		

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DIGITAL DEVELOPMENT PARTNERSHIP

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WITH SUPPORT FROM:

https://www.worldbank.org/en/programs/all-africa-digital-transformation

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