# White Paper

## ICT Talent Cultivation for Kenya's Digital Economy

2022

HUAWEI

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# Foreword by Cabinet Secretary for ICT, Innovation and Youth Affairs

Kenyan youth are the most critical resource the country has and will ever have in the foreseeable future. Therefore, investing in them through provision of relevant skills and training is of utmost importance. It is important for both the government, academia and the private sector to devise relevant programs that directly address the challenges they face with urgency. This includes collaboration to help academia update their curriculum, as well as provision of internships and attachments.

This white paper not only provides relevant findings on the situation of our local ICT talent development but also provides clear guidelines and recommendations to better improve the existing programs in place by academia, industry and government. Kenya's Digital Economy Blueprint provides a framework to improve our ability to catapult economic growth within the country and highlights digital skills and values as one of the critical pillars.

In order to meet the needs and gaps of the ICT workforce, the government has a wide range of initiatives at various levels. This includes the Digital Literacy Program in schools that is increasing digital preparedness at an early age and inspiring our children to want to work in the technology industry. Kenya's gig economy is expected to grow by 33% over the next five years. As such, through programs such as the Ajira Digital program, we are able to equip youth—1.2 million so far—with the relevant skills to seek employment opportunities from anywhere across the world and thereby contribute to the growing gig economy.

We also have programs targeted at industry talent needs, especially the Presidential Digital Talent Program (PDTP). This was achieved through collaboration with industry partners such as Huawei. The program provides government internships, industry internships, and training with our partners. In addition to the PDTP, the Huawei DigiTruck program has worked with the ministry through the Ajira Digital Program to provide digital skills and training to those within underserved communities. I would like to commend Huawei for your commitment and investment in developing local ICT talent.

To Huawei and UNESCO, thank you for this white paper. It has given us food for thought and we will work with our partners to consider how to implement the various recommendations, those that require government leadership as well as those that require private sector engagement.

Thank you!

**Mr. Joe Mucheru, EGH, MBS**

# Foreword by Principal Secretary for State Department for Vocational and Technical Training, Ministry of Education

I would like to commend Huawei and UNESCO for the development of this ICT Talent Cultivation White Paper. Such research will be helpful in providing evidence and ideas for development of ICT policies as far as education and training is concerned.

The State Department for Vocational and Technical Training (VTT) recognizes the importance ICT plays in the delivery of Competency Based Education and Training (CBET) programmes. We are aware that the skills developed in many of our programs are not adequate for the 21st century and specifically in the 4th industrial revolution era.

From doing business in an office setting, to marketing, sales operations, research, product development, automation, and managing risk we require ICT and digital skills. As industries become more digitized and smart, trainees need to develop their capabilities. Even though these digitization trends are still nascent, we are not just training for this year, we are training the skills and knowledge that must be good for the years and decades to come.

So, we need to ensure our TVETs are capable of producing talent with skills they need so they can drive our economy forward. Earlier this year, the State Department and Huawei signed a partnership to enhance ICT talent development within our technical institutions. This initiative has gone a long way in developing digital talent among the youth and especially within the TVET institutions across the country.

Linkages with relevant industry partners and leaders such as Huawei will be sought to identify new trends, transfer technology and learn from the best practices on curricula delivery in order to offer more value to our trainees. The linkages will be cultivated for purpose of building the capacity of our trainers to always remain ready for the future and as such ensure that our students are well trained.

The urgency for more talent cultivation may be derived from a report released by World Bank, which estimates that 230 million jobs within Sub Saharan Africa will require digital skills by 2030. If we don't act now Kenya and Africa will remain in the abyss of an unattractive and labour force that cannot satisfy the modern labour market.

I urge every one of you to dig into the white paper findings and bring out that which will enable us revolutionize skills development for the present and the future.

**Dr. Margaret Wawuda Mwakima**

# Foreword by Huawei Kenya CEO

The pandemic has highlighted the importance of the digital economy to the country's development and increased the urgency of creating more and better jobs for Kenyan youth. However, as the economy evolves, the skills needed to take advantage of the changes and drive change are also changing. Therefore, it is of utmost importance that we nurture and influence the entire ecosystem to build the skills required to take advantage of the digital economy.

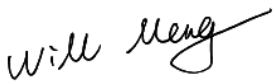
The white paper collects evidence and appeals for combined efforts, both at national and industry levels, for digital talent cultivation in Kenya. It identifies a gap between the existing ICT knowledge and skills demanded by industry and projects an even more significant gap in the future as demand by the industry for more skills to drive and sustain the digital economy. Finally, it provides valuable recommendations for us all to consider.

The ICT sector has been amongst the fastest growing in the country and will continue to be so for years to come. We must be ready for this growth by creating the workforce necessary to meet future needs and current needs. In 2021, 5G networks were launched in Kenya, which will require upgrading existing networks and creating multiple opportunities for different industries to utilize. Fiber to the home grew rapidly at the onset of the pandemic and will continue to grow; meanwhile, the adoption of cloud and data centers is also increasing amongst SMEs and larger businesses. All these will require more personnel in the ICT industry.

But with technology continuing to change rapidly, we need to make sure we, as employers, keep transferring skills to lecturers, to students, and those already in the workforce, so they are prepared for these jobs. At Huawei, we take pride in not only helping grow the ICT infrastructure within the country but also the local ICT talent. We have various initiatives through our training programs, internships, and full-time recruitment. They support a range of beneficiaries from rural unemployed youth to the country's best ICT students, as well as non-technical and technical professionals. In addition, we collaborate closely with the government, academia, UN, and other partners.

We believe Kenya must have a skilled workforce empowered and equipped to take up new opportunities that new and emerging technologies will present to achieve a digital economy. We remain committed to contributing to this agenda and believe this White Paper provides valuable guidance for us all to increase the impact of our efforts.

**Mr. Will Meng**



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# EXECUTIVE SUMMARY

## Background, Problem Statement, Purpose, and Methodology

### Background

The digital economy is increasingly becoming a key driver in the global economy. It is projected that by 2026, it will account for 25% of the global Gross Domestic Product (GDP), up from 15.5 % in 2016. Kenya is amongst the few countries in Africa that are taking an early lead to tap the benefits of digital technologies for economic growth. As a result, while Africa expects the digital economy to contribute about 5.2% of its GDP by 2025, Kenya's digital economy is expected to generate 9.24% of her total GDP by 2025. This, amongst other factors, demonstrates the importance of the digital economy to Kenya's economic prospects and transformation. Therefore, interventions that can contribute to further strengthening the digital economy in Kenya are desirable. One such intervention is talent cultivation.

### Problem statement

The digital economy requires new sets of skills and knowledge, which many countries, including Kenya, are lacking in. By the year 2030, over 230 million new jobs will be created in Sub-Saharan Africa which will require ICT skills. Consequently, an estimated 130 billion USD investment opportunity lies in digital skills cultivation in Africa. During this period, 50-55% of jobs in Kenya will depend on digital skills. These call for concerted efforts, both at national and industry levels, for digital talent cultivation in Kenya to address the gap between the existing ICT knowledge and skills and the projected demand by the industry to help drive and sustain the digital economy.

### Purpose and scope of this White Paper

The purpose of this white paper is to generate evidence to support Kenyan policymakers in developing a country-level strategy on talent cultivation for the digital economy. The specific objectives are to: (a) explore and analyze the need for digital talent cultivation in Kenya; (b) explore the status of talent cultivation in Kenya; and (c) to propose a new talent cultivation approach to meet the demand and challenges identified. These objectives were pursued by addressing the three policy questions shown below:

### Methodology

This white paper adopted a six-step approach, briefly described below:

1. **Demand Analysis** focused on two key areas: understanding the current level of the digital readiness of Kenya and the role of talent cultivation to improve it; and documenting the skills required by the Kenyan ICT industry, currently and in the future.
2. **Supply Analysis** of existing interventions by Kenyan training institutions, the government, private sector as well as development partners in developing talent to meet projected demand.
3. **Analysis of policies and strategies** that support talent cultivation efforts by various stakeholders.
4. **Benchmarking and best practice** to situate and contextualise the current practices on digital talent cultivation in Kenya compared to international best practices. Eight countries (India, Morocco, Tunisia, China, Mauritius, South Korea and UK) that have performed very well in digital readiness rankings and other aspects of the digital economy were used.
5. **Gap analysis** taking into consideration the results of the situation and the benchmarking.
6. **Recommendations** based on the gap analysis and benchmarking for how Kenya can strengthen talent cultivation.

## Main Findings

### 1. Demand for ICT Skills

**a) Kenyan's progress towards the digital economy is still in its early days,** ranked in the top 3 or 5 in Africa in most indexes but lower in the global context: 70 out of 79 countries by Huawei Global Connectivity Index (2020), 84 out of 134 countries by Network Readiness Index (2020) and 105 out 158 countries by UNCTAD's 2021 readiness for frontier technology index (right).

Positions of benchmark countries by UNCTAD Assessment

Singapore: 5
South Korea: 7
China: 25
India: 43
South Africa: 54
Tunisia: 60
Morocco: 77
Kenya: 105

**b) High current and future demand for ICT skills** with 50-55% of jobs in Kenya expected to depend on digital skills by 2030, up from 25-30% in 2019 (Caballero & Bashir, 2020). Agriculture will account for 35-40%, industry 45-50% and services 60-65%. Cumulatively some 32 million ICT skills training opportunities will have been created by then, 21 million will be basic ICT skills (foundational), 1.9 million intermediate skills and 1.3 million advanced skills. In addition, another 8 million training opportunities will be from occupations outside ICT specialties and will be generated by enterprises adopting digital technologies, e.g. accountants using accounting software packages.

**c) Significant ICT skills gaps exist now and are expected in the future** in security, data analysis and processing, cloud computing, IoT and connected devices, and value addition through the incorporation of artificial intelligence and machine learning. Companies are likely to adopt these technologies and need such skills; the gaps in the labour market are serious barriers to the adoption of new technologies (WEF 2020).

**d) Need for National ICT skills database to guide demand** by documenting the current ICT skills gaps in the industry and future ICT skills requirements. There is the Kenya Labour Market Information System (KLMIS), which was established in 2017 and serves as a Labour Market observatory/ intelligence/ watchtower for the economy through the provision of timely, relevant, and reliable labour market information. However, inadequate funding limits KLMIS capacity to undertake regular research, data collection and sectoral surveys.

Benchmarks

Some countries undertake annual ICT skills surveys to inform ICT skills development plans. For example, Morocco has in place the Digital Skills Matrix, while South Africa has University Advisory Boards that check the current ICT industry trends and aligns them with the training in universities.

### 2. Supply of ICT skills

**a) Need to update strategy on ICT Talent Cultivation to build on the policies.** The Digital Economy Strategy has a commendable pillar on ICT Skills that needs to be turned into an in-depth plan. Provisions related to talent cultivation are scattered in different policies and are being implemented by different agencies (if implemented at all), making coordination difficult. The only standalone strategy, ***National ICT Strategy for Education and Training (2006)*** needs to be updated.

**b) Initial progress at enhancing ICT readiness at basic education level** from DLP investments ensuring most primary schools now have electricity and devices, but still need to ensure adequate skilled ICT teachers and connectivity. Need to expand programme to secondary schools and only 19 % of Kenyan households have computers for effective learning at home.

**c) Growing—but still low—number of ICT graduates at intermediate and advanced ICT skills level** with total estimated at less than 5,000 ICT students graduating per year.

**d) Need to support girls and women to get into ICT careers** as they only make up around a third of current ICT students due to many barriers; not studying ICT means women missing out the good quality job opportunities available to them in the industry which are growing fast, and the country misses out on a large pool of talent.

**e) Progress with online content but low use of e-Learning** due to relatively high cost of internet connectivity, low ownership of devices suitable for learning, power challenges and low ICT literacy skills. KICD and many private providers of online content have made great progress during COVID-19. Projections by the 2020 World Economic Forum Report on future of jobs indicate that the demand for online learning

and training will rise several fold.

**f) Limited progress so far ensuring ICT curricula are market driven** as still a disconnect between academia and the private sector on the whole. Despite some exceptions, this leads to universities offering curricula and teaching practices that are not adequately aligned with the needs of the job market. With a rapidly evolving ICT technologies and the slow curricula review processes, most universities are constrained to catch up with expanding demand for IT skills on emerging technologies.

**g) Need for more funding and opportunities for industrial attachment and internships** especially at TVET level. PDTP is very helpful for graduate students, but there are few undergraduate internship opportunities and most students have to find their own industrial attachments and internships with only 5% helped by their respective departments. There is also scarcity of industrial attachment opportunities offered by the private sector.

Benchmarks and Best Practices

- In India, as a policy, all TVETs and universities are required to have a dedicated training and placement cell headed by Training and Placement Officer (TPO) to address all aspects of industrial attachment and internship.
- Tunisia has a national agency responsible for industrial attachment and internship.
- China has introduced a framework for supporting their graduates to undertake sponsored internships in UN bodies.

**h) Weak Academia-Industry collaboration overall despite some successes.** Tertiary institutions in Kenya collaborate with industry in various ways including curriculum development, student placement, staff engagement and consultancies, innovation and community-based initiatives. Several institutions have set up incubators, accelerators, and hubs with varying success and the Kenya Industry and Entrepreneurship Project (KIEP) in collaboration with Linking Industry with Academia (LIWA) and The Kenya Private Sector Alliance (KEPSA) aims to increase productivity and innovation in selected private sector firms. However, the level of university-industry collaboration is rated low due to several barriers including the absence of policies for incentivizing partnership efforts in the universities, and lack of institutional and national support structures to coordinate establishment of such partnerships.

Benchmarks and Best Practices

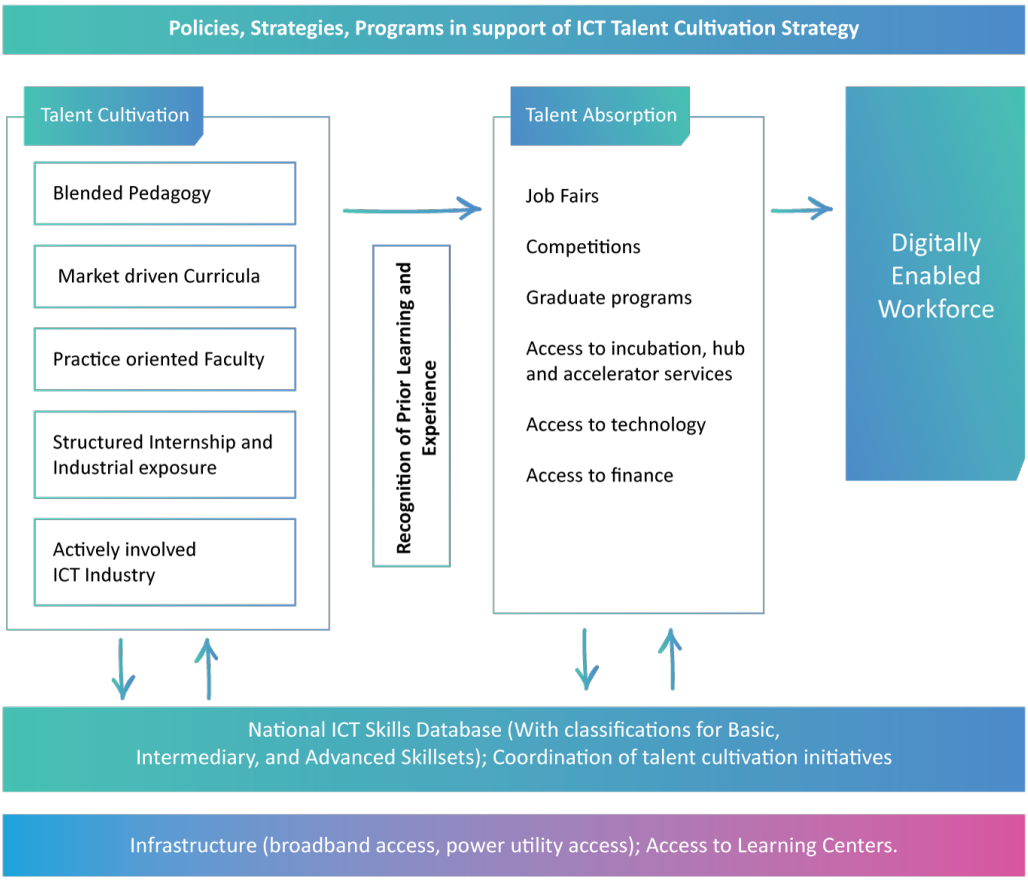
China encourages universities to establish university-run enterprises, supports collaborative R&D between universities and industries and allow large sized private enterprises to run apprenticeship programs. Tunisia requires that each TVET Centre should have a public-private advisory committee chaired by private sector representative. Mauritius has a program to attract business to locate near university campuses whereas Singapore, through their CorpLab@university scheme, support the establishment of key laboratories by industries in universities.

**i) Incentives for private sector participation have not been implemented.** The Education for Sustainable Development Policy for Education Sector (2017) and the National ICT Policy (2019) have provided for incentives to enable ICT companies to participate in ICT training and apprenticeship for students from tertiary institutions. The former commits the government to provide tax incentives to companies offering apprenticeships and the latter commits the government to incentivize industry with ICT specialization to conduct their own training programs and contribute to institutional training programs. However, these provisions have not been implemented. Currently, the few ICT industries that participate in training and provision of industrial attachments and internships do so on their own accord. As a result, there are not adequate opportunities for industrial attachments and internships for the ICT students.

Benchmarks and Best Practices

Some countries such as Singapore and South Korea, are effectively implementing incentive programs. For example, under the US$ 50 billion Korean Digital New Deal, which is an ambitious plan to enable digital technology players in the private sector to create an enabling eco-system for innovation, the government intends to provide incentives such as lowered taxes, and procurement quotas for businesses to hire young employees in IT-related fields and for providing short-term internship programs for young employees. On the other hand, the government of Singapore has an incentive structure which include providing subsidy or grants to businesses for training local talent to operate new technologies.

## 3. Desired Future ICT Talent Cultivation Approach




Based on the Situation analysis, benchmarking, and gap analysis, The Figure above presents a picture of how an effective ICT talent cultivation framework could look like.

**a. Policies, strategies and programmes:** Updated, integrated, and aligned set of policies, strategies and programmes that are implemented.
**b. Infrastructure:** Enhancement of relevant infrastructure in educational institutions and individuals' homes.
**c. Blended and ICT supported pedagogy:** A move from the traditional face-to-face teaching to blended (face-to-face) and online, to facilitate enhancement of the number of ICT students admitted and graduated to meet the increasing demand for ICT skills without significantly expanding the infrastructure and compromising the quality.
**d.Market driven curricula:** This requires enhanced involvement of the industry players in curriculum through well-coordinated academia-industry collaboration.
**e. Practice oriented Faculty:** A move from the traditional academic oriented faculty to a faculty with blended academic/industry experience. This may require faculty to spend some time in industry as well as the use of industry professionals as part time faculty.
**f. Internship and industrial attachment:** Increase in supply of industrial attachments and internships based on incentives and expected tangible benefits, and better matching.
**g. Involvement in training and certification by ICT industry:** Policy incentives and guidelines to encourage participation of more ICT private players in the training and certification of ICT graduates.
**h. Recognition of prior learning and experience:** An approach that recognizes prior learning and experience in ICT fields for the purpose of certification
**i. Talent Absorption:** Involvement of the private sector, development partners and NGOs in enhancing employability and opportunities for self-employment through job fairs, competitions, and graduate programs, as well as access to new technologies and finance.
**j. National ICT Skills Database:** To inform curricula, other trainings, and job placement.
**k. Coordination:** Coordinate initiatives by government, development partners, private sector and NGOs, to expand the scope and outreach so more Kenyans benefit.

## Recommendations

To improve ICT Talent Cultivation in Kenya and grow the Digital Economy, the following recommendations should be considered:

1. **Develop an ICT Talent Cultivation Strategy**
   The government, under the leadership of the Ministry of Education supported by the Ministry of ICT and other relevant stakeholders should develop an ICT Talent Cultivation Strategy by updating the existing National ICT strategy for Education and Training, 2006, and to operationalize the Digital Economy Strategy Skills and Values Pillar.

   The strategy should identify how to enhance existing initiatives and set -up new initiatives to attract more students into ICT courses and careers, particularly for women, and enhance their skills at intermediate and advanced levels, to meet the expected future demand. This includes initiatives to upskill existing workers to meet industry requirements. Better use of online learning may be a critical channel for this. Such programs must also be targeted to make sure all can access them and no-one gets left behind, such as the disabled or those in remote areas.

2. **Establish a National ICT Skills Database**
   The government, under the leadership of the Ministry of Labor and Kenya National Bureau of Statistics and in collaboration with the Ministry of ICT and other relevant stakeholders should develop, within the National Labor Market Information System, a National ICT Skills Database, which should be updated yearly due to the rapidly evolving ICT technologies. It should be based on a clear assessment of the kinds of skills needed for different types of workers in different sectors that can then inform training programs for such workers and calculations of future demand.

3. **Improve Academia-Industry collaboration and support for upscaling private sector initiatives and certification programs**
   There is a need to develop coordination structures to strengthen academia-industry collaboration including training and internships for faculty, and mechanisms to review, support, and scale-up success stories of such collaborations as well as other private sector programs including private sector certification initiatives. The government, under the leadership of the Ministry of Education and in collaboration with Ministry of ICT, could help facilitate such structures.

4. **Revisiting the process of ICT curricula review**
   The government, under the leadership of the Commission for University Education, KNQA, CDAC and TVETA and in collaboration with the Ministry of Education and the Ministry of ICT should come up with modalities of fast tracking the review of ICT curricula.

5. **Implement Policy Incentives for Private Sector Participation in ICT Talent Cultivation**
   The government, under the leadership of Treasury, and in collaboration with the Ministry of Education and relevant stakeholders should implement the various incentives in Education for Sustainable Development Policy for Education Sector (2017) and the National ICT Policy (2019), to encourage ICT companies to participate in ICT training, industrial attachments, internship, and certification programs.

# LIST OF ABBREVIATIONS

| | |
|---|---|
| ACTEC | American College of Trust and Estate Counsel |
| AfDB | African Development Bank |
| AFRALTI | African Advanced Level Telecommunications Institute |
| AGPO | Access to Government Procurement Opportunities |
| AGRF | African Green Revolution Forum |
| AI | Artificial Intelligence |
| BI | Business Intelligence |
| BPO | Business Process Outsourcing |
| CAMAT | Communications and Multimedia Appeals Tribunal |
| CA | Communications Authority of Kenya |
| CBC | Competency Based Curriculum |
| CBI | Centre for the Promotion of Imports |
| CCK | Communications Commission of Kenya |
| CEC | County Executive Committee |
| COE | Centre of Excellence |
| CTA | Technical Centre for Agricultural and Rural Cooperation |
| CUE | Commission of University Education |
| DOT | Digital Opportunity Trust |
| DLP | Digital Literacy Program (DigiSchool) |
| EFA | Education for All |
| EMIS | Education management information systems |
| EPF | Education Policy Framework |
| GDP | Gross domestic product |
| HMTP | Huawei Management Trainee Program |
| ICTA | Information and Communication Technology Authority |
| ICT | Information and Communication Technology |
| IFC | International Finance Corporation |
| IITE | Indian Institute of Teacher Education |
| IoT | Internet of Things |
| IP | Intellectual Property |
| IT | Information Technology |
| ITES | Information Technology Enabled Services |
| ITU | International Telecommunications Union |
| ISCED | International Standard Classification of Education |
| JKUAT | Jomo Kenyatta University of Agriculture and Technology |
| KCPE | Kenya Certificate of Primary Education |
| KEMSA | Kenya Medical Supplies Authority |
| KENET | Kenya Education Network Trust |
| KESSP | Kenya Education Sector Support Program |
| KICD | Kenya Institute of Curriculum Development |
| KICTB | Kenya ICT Board |
| KICTP | Kenya ICT Program |
| KoTDA | Konza Technopolis Development Authority |
| KNBS | Kenya National Bureau of Statistics |
| KNEC | Kenya National Examinations Council |
| KNLS | Kenya National Library Service |
| KYDP | Kenya Youth Development Policy |
| LIA | Letter of Interim Authority |
| LMS | Learning Management System |

| | |
|---|---|
| MDGs | Millennium Development Goals |
| MOE | Ministry of Education |
| MoICT | Ministry of Information, Communications and Technology, Innovation and Youth Affairs |
| MOU | Memorandum of understanding |
| ML | Machine Learning |
| MTP | Medium Term Plans |
| NCS | National Communications Secretariat |
| NEPAD | New Partnership for African Development |
| NEMIS | National Education Management Information System |
| NGO | Non-Governmental Organizations |
| NOFBI | National Optic Fibre Backbone Infrastructure |
| NTF | Netherlands Trust Fund |
| ODEL | Open, Distance and e-Learning |
| PDTP | Presidential Digital Talent Program (DigiTalent) |
| PWDs | Persons with disabilities |
| QMIS | Query Management Information System |
| SDG | Sustainable Development Goals |
| SME | Small and medium-sized enterprises |
| SNE | Special Needs Education |
| STEM | Science, technology, engineering, and mathematics |
| SSA | Sub-Saharan Africa |
| TIMS | Transport Information Management System |
| TVET | Technical and Vocational Education and Training |
| UNCTAD | United Nations Conference on Trade and Development |
| UNESCO | The United Nations Educational, Scientific and Cultural Organization |
| UNIDO | United Nations Industrial Development Organization |
| USD | United States dollar |
| USF | Universal Service Fund |
| WEF | Women Enterprise Fund |
| WFEO | World Federation of Engineering Organizations |
| WIB | Women in Business |
| WITH | Women in Tech |
| YEDF | Youth Enterprise Development Fund |

# SECTION ONE

## BACKGROUND, OBJECTIVES AND METHODOLOGY

### 1.1. Background to this white paper

The digital economy is increasingly becoming a key driver in the global economy. In 2016, it accounted for 15.5% of the global Gross Domestic Product (GDP) and was projected to increase to 25% by 2026 (The World Bank Group, 2019). Kenya is amongst the few countries in Africa that are taking an early lead to tap the benefits of digital technologies for economic growth. This is demonstrated by the steps taken by the government to put in place various policy and legal instruments and infrastructure to drive the digital economy. As a result, while Africa expects the digital economy to contribute about 5.2% of its GDP by 2025, Kenya's digital economy is expected to generate 9.24% of the total GDP by 2025 (Accenture, Africa iGDP Forecast, 2020). This, amongst other factors, demonstrates the importance of the digital economy to Kenya's economic prospects and transformation. Therefore, interventions that can contribute to further strengthening the digital economy in Kenya, are desirable. One such intervention is talent cultivation.

The digital economy requires new sets of skills and knowledge, which many countries lack. It is projected that by 2030, over 230 million new jobs will be created in Sub-Saharan Africa which will require ICT skills, and that an estimated $130 billion investment opportunity lies in digital skills cultivation in Africa (The World Bank Group, 2019). A labour market analysis from the International Finance Corporation (IFC) and the World Bank showed that by 2030, 50-55% of jobs in Kenya will depend on digital skills, in comparison to 35-45% in Nigeria, one of Africa's largest economies[1]. These call for concerted efforts for talent cultivation in ICT to develop the required human capital with skills and competencies to help drive and sustain the digital economy of Kenya.

Talent cultivation can be examined at both the national level and industry perspectives. At the national level, talent cultivation refers to interventions a country undertakes to meet the industry requirements for ICT knowledge and skills in various sectors of the economy: getting a highly qualified workforce readily available for highly effective delivery of products and services. At the industry level, talent cultivation refers to how organizations develop and nurture skills to enable their workforce to be well equipped for the day-to-day deliverables (The Highlands Company, 2017). For this white paper, the national level perspective was adopted.

This white paper seeks to explore the current digital talent cultivation landscape in Kenya, identify challenges and opportunities and provide recommendations on how talent cultivation for the digital economy can be strengthened. This will contribute towards the Kenyan Government's efforts towards accelerating uptake of the digital economy. The ICT industry is expected to be key in driving the transition to a green and digital economy and promote the emergence of new forms of entrepreneurship with new possibilities for solutions to socio-economic challenges through digital innovations. It will also foster actualization of Africa's Agenda 2063 and the Sustainable Development Goals (SDGs). This notwithstanding, the success of the digital economy depends on many indispensable factors including school education, talent supply, policy support, and strategic partnerships. These enabling environments must be analysed critically to define the entry points for ICT development. Understanding and analysing the status of Kenya's digital economy is, therefore, key to reorienting the country's education and training systems, developing relevant and effective policies, enhancing industrial settings, and building strategic partnerships to facilitate human resource development that meets the knowledge, competencies, skills, innovation, and creativity required of today's digital transformation.

### 1.2. Purpose and Objectives of this White Paper

The purpose of this white paper is to generate evidence to support Kenyan stakeholders in developing a country-level strategy on talent cultivation for the digital economy. Specifically, the paper will endeavor to:

- **Objective 1:** Explore and analyze the need for digital talent cultivation in Kenya,
- **Objective 2:** Explore the status of talent cultivation in Kenya
- **Objective 3:** Propose a new talent cultivation approach to meet the demand and challenges identified

The White Paper will address the following three key policy questions (Figure 1.1.):

[1] https://www.weforum.org/agenda/2020/10/africa-needs-digital-skills-across-the-economy-not-just-tech-sector/


Figure 1.1: The key policy questions to be addressed by the white paper

## 1.3. Methodology

This white paper takes a seven-step approach: demand analysis, supply analysis, analysis of supporting policies and strategies, gap analysis, benchmarking, recommendations, and validation. These steps are briefly described in Figure 1.2:

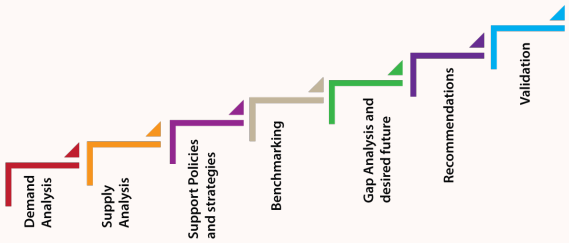



Figure 1.2: The seven-step methodology adopted for the study

### 1.3.1. Demand Analysis

Demand analysis aims to provide evidence on the importance of talent cultivation to drive the digital economy. This analysis focuses on two key areas: understanding the current level of the digital readiness of Kenya and the role of talent cultivation to improve it; and documenting the skills required by the Kenyan ICT industry, currently and in the future. Table 1.1 gives a summary of the information sought and how it was obtained.

| Areas | Sub-area | Information Sought | How information was obtained |
|---|---|---|---|
| **Demand Analysis** | Kenya digital readiness | The latest ranking and the role of talent cultivation | Reviewed the following documents:<br>1. UNCTAD's 2021 Innovation ranking<br>2. The 2020 Huawei Connectivity Index<br>3. Network Readiness Index |
| | ICT skills needed by Kenyan ICT industry | Sectors where ICT skills will be required, category of skills required, current and future ICT skills required | 1. Reviewed the Kenyan ICT industry<br>2. Reviewed other relevant documents including Kenya National Bureau of Statistics; World Economic Forum, UNESCO, and World Bank |

Table 1.1: A summary of the information sought and how it was obtained

### 1.3.2. Supply Analysis

Supply analysis aims to generate information on existing interventions by Kenyan training institutions, the government, private sector as well as development partners in developing talent to meet the demand for ICT skills (Table 1.2):

| Areas | Sub-area | Information Sought | How information was obtained |
|---|---|---|---|
| **Supply Analysis** | Role of Kenya's ICT education system to contributing to the needed ICT skills | The extent to which the Kenyan ICT training institutions are meeting the ICT skills demands in terms of quantity, pedagogy, content, internships and industrial attachment and placements. | Reviewed existing documents on ICT training by Kenyan Education Institutions at basic and higher levels. |
| | Programs and initiatives by the private sector | Successes and shortcomings of existing programs and initiatives by the private sector in in contributing to talent cultivation for the digital economy | Reviewed selected existing programmes and initiatives by the private sector |

Table 1.2: A summary of the information sought and how it was obtained

### 1.3.3. Supporting Policies and Strategies

The purpose of the analysis of the existing policies and strategies was to explore the adequacy of these policies and strategies to support talent cultivation efforts by various stakeholders and identify areas of improvements. Table 1.3 shows the reviewed policies and strategies.

| Areas | Information Sought | How information was obtained |
|---|---|---|
| **Support Policies and strategies** | Extent to which existing policies and strategies related to ICT address the following issues of talent cultivation to the digital economy:<br>a. Pedagogy and content<br>b. Industrial attachment and internship.<br>c. Placement and self-employment.<br>d. Incentives for private sector participation.<br>e. Coordination of the various initiatives and programs. | Reviewed the following policies and strategies, amongst others:<br>1. Kenya Vision 2030<br>2. Kenya National ICT Policy (2019)<br>3. Kenya Digital Economy Strategy<br>4. Kenya National ICT Masterplan (2014-2017)<br>5. National Skills Development Policy (2020)<br>6. Science, Technology and Innovation Policy (2021)<br>7. Technical and Vocational Education and Training (TVET) Policy<br>8. Recognition of Prior Learning (RPL) Policy Framework in Kenya<br>9. Draft Technical and Vocational Education and Training (TVET) Policy. |

Table 1.3: Lists of policies and strategies reviewed and the information sought.

### 1.3.4. Benchmarking and best practice

To situate and contextualise the current practices on digital talent cultivation in Kenya, it was important to benchmark them with international best practices, where specific initiatives have been successfully developed and implemented to address the identified challenges. For this purpose, the following countries that have performed very well in digital readiness rankings and other aspects of digital economy were used.

**Benchmarking countries**

1. Three from lower middle-income countries (India, Morocco, Tunisia)
2. Two from Upper middle-income countries (China, Mauritius)
3. Two from high-income countries (South Korea and UK)

### 1.3.5. Gap Analysis

Taking into consideration the results of the situation analysis and the benchmarking, the gap analysis was undertaken to document the key areas of interventions.

### 1.3.6. Recommendations

From the data obtained through benchmarking, taking into consideration the unique context of Kenya as well as her aspirations to become one of the top countries in the region in terms of digital economy, appropriate recommendations are made on how Kenya can strengthen talent cultivation.

# SECTION TWO

## PRESENTATION OF THE FINDINGS

### 2.1. DEMAND ANALYSIS FOR TALENT CULTIVATION

#### 2.1.1. Kenya's Digital Readiness

It has been projected that the global digital economy will be worth US $ 23 trillion by the year 2030 with countries like Kenya eying the opportunities that the digital economy can offer, (Odhiambo, 2020). The quest to be at the forefront in the digital economy wave has led many countries globally to prepare across various areas to be ready for the digital economy. Digital readiness from a country perspective, demonstrates how a country is prepared digitally to serve and offer services to its citizens, and the infrastructural foundation to achieve the service delivery while ensuring citizens are aptly equipped to support digital interventions through knowledge generation, transfer and retention. In this white paper, the digital readiness of Kenya has been documented with a focus on talent cultivation based on analysis of the 2020 Huawei Global Connectivity Index (GCI), and the Network Readiness Index (NRI). These have been complemented with UNCTAD's 2021 Technology and Innovation report. The following are the main findings from the analysis.

**1. The 2020 Huawei Global Connectivity Index (GCI)**

Finding 1: The Huawei Global Connectivity Index shows that Kenya has made progress but still performs poorly globally, ranking position 70 out of 79 countries reviewed and scoring only 31 points out of 120. Regionally Kenya ranked fifth behind South Africa, Morocco, Algeria, and Egypt. Kenya performed poorest in IT workforce[2] and software development.

The 2020 Huawei Global Connectivity Index (GCI) provides important data showing how countries are progressing towards the digitalization of their economies. The GCI tracks the relationship between infrastructure investment and economic growth to provide policymakers with trends and information they need to make for sound policy making, as they strive to lead their economies from the Covid-19 pandemic towards a more competitive position through digitalization of their economies based on four pillars (supply, demand, experience, and potential), four technology enablers (fundamentals, broadband, cloud, and IoT and AI), and 40 indicators as illustrated in Box 2.1. The Huawei Global Connectivity Index shows that globally Kenya performed poorly, ranking in position 70 out of 79 countries reviewed and scoring only 31 points out of 120. Regionally, Kenya is in position 5 behind South Africa, Morocco, Algeria, and Egypt. As described below, Kenya performed lowest in IT workforce and software development, scoring only 2 points out of 10 for IT workforce and 1 point for software development

Box 2.1: Four pillars and 40 indicators considered in the Huawei's Global Connectivity Index

| TECHNOLOGY ENABLERS | FOUR PILLARS | | | |
|---|---|---|---|---|
| | **SUPPLY** Measures current levels of supply for ICT products and services used for digital transformation | **DEMAND** Gauges demand connectivity in the context of users and activities relating to digital transformation initiatives. | **EXPERIENCE** Comprises variables for analyzing the experience of connectivity for end-users and organizations in today's digital economy. | **POTENTIAL** Comprises a forward-looking set of indicators that point towards the future development of the digital economy. |
| FUNDAMENTALS | • ICT Investment<br>• Telecom Investment<br>• ICT Laws<br>• International Internet Bandwidth<br>• Security Software Investment | • App Downloads<br>• Smartphone Penetration<br>• eCommerce Transactions<br>• Computer Households<br>• Secure Internet Servers | • E-Government Services<br>• Telecom Customer Services<br>• Internet Participation<br>• Broadband Download Speed<br>• Cybersecurity Awareness | • R&D Expenditure<br>• ICT Patents<br>• IT Workforce<br>• Software Developers<br>• ICT Influencing New Business Models |
| BROADBAND | • Fibre Optic 4G & 5G connections | • Fixed Broadband Subscriptions<br>• Mobile Broadband Subscriptions | • Fixed Broadband Affordability<br>• Mobile Broadband Affordability | • Broadband Potential<br>• Mobile Potential |
| CLOUD | Cloud Investment | Cloud Migration | Cloud Experience | Cloud Potential |
| INTERNET OF THINGS AND AI | • IoT Investment<br>• AI Investment | • IoT Installed Base<br>• AI Demand | • IoT Analytics<br>• Data Creation | • IoT Potential<br>• AI Potential |

[2] The indicator IT workforce measures total employment in the supply and management of IT for each country. These include workers employed directly in the IT industry (hardware manufacturers, software vendors, service providers and channel organizations) and IT staff employed by end users in IT departments for management, deployment, support and strategic implementation of technology solutions. The indicator on software developers measures the total number of software developers per capital.

The 2020 GCI was undertaken in the context of Covid-19 pandemic with projections indicating that as business stabilizes into the new normal, organizations will operate more digitally. The new normal created by the Covid-19 pandemic will feature the following characteristics:

1. Increased dependence on high-speed broadband for remote working and education;
2. Cloud computing for the affordable automation of business process and the provision of scalable infrastructure for the storage, processing and delivery of information and services;
3. Artificial intelligence for facilitating decision-making and process automation with solutions such as chatbots;
4. Internet of things devices that enable automation of process and services and the deliver greater supply-chain resilience;
5. Technologies that reduce telecom network and data center total cost of operational and operation expenditures.

## 2. Network Readiness Index 2020

Finding 2: The Network Readiness Index 2020 ranks Kenya in position 82 out of 134 countries and position three regionally, behind South Africa (76) and Mauritius (61). The indicator related to ICT skills posted the third lowest score.

The Network Readiness Index 2020, on the other hand, examined 134 economies and based the report on the performance of these economies across 60 variables grouped under four key thematic areas: technology, people, governance, and impact (Table 2.2.).

| Thematic Areas | Details of what was measured |
|---|---|
| Technology | 1. Access - communication infrastructure and affordability<br>2. Content - the type of technologies produced in the countries and the content/application that can be deployed locally<br>3. Future technologies - the extent to which countries are prepared for the future of network economy |
| People | 1. Individual - how individuals use technology and how they leverage their skills to participate in the network<br>2. Businesses - how business use ICT and participate in the network economy<br>3. Government - how government use and invest in ICT for the benefit of the general population |
| Governance | This pillar seeks to capture how conducive the national environment is for a country's participation in the network economy, based on issues of trust, regulation, and inclusion. |
| Impacts | This pillar seeks to assess the economic, social and human impact of participation in the network economy |

Table 2.2.: Assessment criteria for the Network Readiness Index 2020

The Network Readiness Index 2020 ranks Kenya in position 82 out of 134 countries and position three regionally, behind South Africa (76) and Mauritius (61). As shown in the Table 2.1, individual indicator, which measures how individuals use technology and how they leverage their skills to participate in the network, was the third lowest ranking for Kenya with a score of 106 out 34 countries (Table 2.3)

| PILLAR | INDICATORS | SCORE | PILLAR | INDICATORS | SCORE |
|---|---|---|---|---|---|
| Technology | Overall score | 99 | Governance | Overall score | 50 |
| | Access | 101 | | Trust | 58 |
| | Content | 115 | | Regulation | 65 |
| | Future Technologies | 49 | | Inclusion | 70 |
| PILLAR | INDICATORS | SCORE | PILLAR | INDICATORS | SCORE |
| People | Overall score | 78 | Impact | Overall score | 104 |
| | Individual | 106 | | Economy | 94 |
| | Business | 51 | | Quality of life | 100 |
| | Government | 41 | | Contribution SDGs | 108 |

Table 2.3: Summary of Kenya's performance globally.

## 3. UNCTAD's 2021 Innovation ranking

Finding 3: Analysis shows the ranking and scores with, Kenya in position 10 amongst African countries and in position 105 globally and that amongst the five building blocks, Kenya ranked lowest in the skills sector.

The United Nations Conference on Trade and Development (UNCTAD's) 2021 Technology and Innovation report selected five building blocks to measure the capacity to use, adopt and adapt frontier technologies (readiness for frontier technology index). These are ICT deployment, skills, R&D activity, industry activity, and access to finance (Table 2.4)

Table 2.4: Building blocks used for measurements in UNCTAD's 2021 Innovation Ranking

1. **ICT deployment** – Using, adopting, and adapting frontier technologies requires sufficient ICT infrastructure, especially since AI, IoT, big data, and blockchain are internet-based technologies. Two aspects of ICT infrastructure need to be considered: adequacy to ensure that everyone has access and that no one is left behind, and the quality of infrastructure that allows for more advanced and efficient use. For these purposes, internet users as a percentage of the population capture the adequacy, while the mean download speed measures the quality of internet connection.
2. **Skills** – Using, adopting, and adapting frontier technologies needs people equipped with relevant skills. Two types of skills need to be considered: skills acquired through education, and skills acquired in the workplace through practical training or learning-by-doing. The overall educational attainment of the population is measured through expected years of schooling, while the skill level in the labour market is measured by the extent of high-skill employment.
3. **R&D activity** – R&D activity is needed not just to produce frontier technologies, but also for adoption and adaption, as these technologies often require adjustment or modification for local use. R&D activities are measured using the number of publications and patents filed on the 11 frontier technologies in a country.
4. **Industry activity** – This captures ongoing activities in an industry related to the use, adoption, and adaptation of frontier technologies and considers three sectors that are early adopters: manufacturing, with high-tech manufacturing; finance; and ICT. It also includes export data, on high-technology manufactures, as well as on digitally deliverable services. In developing countries, activities are also undertaken by firms in the informal sector.

The analysis shows that Kenya is ranked in position 10 in Africa and in position 105 globally; and within the five building blocks, Kenya ranks lowest in the skills sector (Table 2.5).

| Country | Total Score | Ranking | | | | | |
|---|---|---|---|---|---|---|---|
| | | Total | ICT | Skills | R&D | Industry | Finance |
| South Africa | 0.55 | 54 | 69 | 84 | 39 | 71 | 13 |
| Tunisia | 0.51 | 60 | 80 | 62 | 61 | 45 | 50 |
| Morocco | 0.45 | 76 | 78 | 120 | 50 | 57 | 35 |
| Mauritius | 0.45 | 77 | 83 | 58 | 94 | 74 | 40 |
| Egypt | 0.38 | 87 | 117 | 67 | 42 | 100 | 116 |
| Namibia | 0.34 | 91 | 97 | 109 | 101 | 59 | 58 |
| Gabon | 0.33 | 94 | 103 | 99 | 133 | 43 | 143 |
| Cabo Verde | 0.29 | 101 | 92 | 107 | 153 | 82 | 63 |
| Ghana | 0.28 | 103 | 106 | 121 | 81 | 90 | 148 |
| Kenya | 0.28 | 105 | 108 | 123 | 78 | 89 | 108 |

Table 2.5: UNCTAD's ranking of global ICT, Technology, and innovation scores

### 2.1.2. Demand for ICT skills in Kenya's ICT Industry

The purpose of this review was to document: the sectors of the economy where ICT skills will be required; the type of skills that will be required in these sectors; the current and future demand for ICT technologies; which companies require which skills; the impact of covid-19 pandemic on adoption of technologies and the number of ICT jobs that will be required.

**1. Sectors where ICT skills will be required**

Finding 1: The demand for ICT jobs in Kenya is likely to be found in key sectors. These are FinTech, manufacturing building and construction; international trade; transport and infrastructure; health, agriculture, forestry, and land management; energy; and education

The Vision 2030 Medium Term Plan III, the Big Four Initiative as well as the draft National STI Policy (2020) and the National Research Priorities (2019) all demonstrate the following areas where ICT skills will be required:

a. ***ICT in the Finance sector:*** ICT is playing a major role in developing solutions for the Finance Sector (known as FinTech). For example, M-PESA has contributed immensely to financial technology integration in the financial sector, making Kenya become one of the world's leading in financial inclusion. Traditional banking institutions and micro-finance have now followed suit to fill the digital space with financial technology access through various mobile apps that provide financial access to many.

b. ***ICT in Manufacturing, Building, and Construction sectors***: In the Kenyan Industrial sectors, there will be increased adoption of technologies such as 3D printing, advanced robotics, and the Internet of Things to improve manufacturing operations in factories. The manufacturing industry has seen an application of customer relations management systems and logistic systems to ensure warehouse processes are aligned with the supply and sales departments for easy monitoring of stocks and demand trends.

c. ***ICT in the International Trade sector:*** The adoption of eCommerce platforms, digital payment systems, digital ledgers, digital logistical systems, and Customer Relationship Management (CRM) are examples of the integration of ICT in international trade.

d. ***ICT in Transport & Infrastructure sectors:*** Areas of application of ICT in the transport sector include digital payment systems; the vehicle flow detection cameras; vehicle tracking systems; fleet management; online taxis; and the digitization of vehicles details management initiated by the National Transport and Safety Authority[3].

e. ***ICT in the Health sector:*** In the Health sector, the adoption of several initiatives such as telehealth systems like M-Dawa, an electronic-based pharmacy bringing together several pharmaceutical companies, shows how ICT has been integrated with the healthcare sector. Institutions like the Kenya Medical Supply Agency (KEMSA)[4] have also adopted a robust stock management system showing that government agencies have begun implementing digitization processes.

f. ***ICT in Agriculture, Forestry & Land management sectors:*** Major ICT integration is also manifest in agriculture, land, and environment. Smart agriculture is increasingly becoming an important component in the agricultural sector that increases production and mitigates risks. The adoption of blockchain technology to increase networking of farmers and linkages to FinTech among other benefits like markets has brought in a new dimension of how ICT can be applied. In the land management sector, the Government of Kenya (GoK) recently launched a digitization process of the land registry[5]. The launch signifies a major shift of one of the most important government agencies to adopt ICT as a key component of its mandate. ICT can also be applied in various areas of environment management including streamlining the registration processes[6].

g. ***ICT in the Energy sector:*** The power sector has also progressively seen an increase in the adoption of ICT platforms to manage the supply and distribution of electricity. This includes the use of outdoor smart meters and a smart grid platform which has enabled customers and utility providers to understand and get clearer trends on energy consumption and energy-efficient production. Digital platforms such as PayGo and M-Kopa have also enabled the population to benefit from clean cooking energy and lighting energy respectively.

h. ***ICT in Education sector:*** In the education sector, a good example of ICT interpretation can be seen in the Kenya Institute of Curriculum Development-led digital learning platform called the DigiSchool[7]. The virtual learning programs in institutions of higher learning are also great ways of how ICT has been integrated with the education sector. In addition, ICT can be applied in various aspects of administration of education including students' admission, registration, examination, and monitoring and evaluation.

[3] http://ntsa.go.ke/
[4] https://www.kemsa.co.ke/e-services/

## 2. Category of skills required

Finding 2: There are three categories of ICT skills that are required to drive the digital economy – these are basic (foundational) digital skills, intermediate digital skills, and advanced digital skills. The integration of these skills can be looked at from five dimensions, data storage, data accessibility, data analytics, decision support systems and value addition services.

Kenya national ICT Policy (2019) as well as World Economic Forum (WEF, (2019) have identified three categories of skills required for the digital economy - basic (foundational) digital skills, intermediate skills and advanced digital skills (Table 2.6). According to the UNESCO Digital Literacy Global Framework (DLGF), foundational skills are entry level functional skills required for rudimentary use of digital devices and applications, equivalent to general secondary school educational level; intermediate skills are skills that enable an individual to make substantive and beneficial use of online applications and services equivalent to secondary/ post-secondary TVET educational level; while advanced skills are a group of skills that form the basis of technical problem solving and data safety, equivalent to a university degree level. DLGF also identifies highly specialized skills that form the basis of specialized ICT occupations and professions, equivalent to a post-graduate degree. Strategies that will enable the effective provision of ICT training and education at the three (or four) levels are important to drive the digital economy.

| Basic (foundational) digital Skills | Intermediate digital skills | Advanced digital skills |
|---|---|---|
| • Web research<br>• Online communication<br>• Use of professional online platforms<br>• Use of digital financial services | • Digital graphic design and marketing<br>• Desktop publishing and social media management skills for both job and entrepreneurship opportunities | • Technology development<br>• Network management<br>• Machine learning<br>• Big data analysis<br>• IoT<br>• Cybersecurity<br>• Blockchain technology |

Table 2.6: Three categories of ICT skills that are required to drive the digital economy

Integration of ICT across different sectors can be investigated from five key dimensions namely, data storage, data accessibility[8], data analytics[9], decision support systems[10], and value addition services (Box 2.2.)[11]. Data security as a dimension is a crosscutting theme that traverses across all the five mentioned dimensions.

- **Data Storage** refers to enabling efficient and secure storage of the huge data capacity that is needed by the entire cluster of the economic sectors, in such a manner that provides several layers of retrieval securely, and efficiently.
- **Data Access** provides a critical service to the sectors. Without accessibility through a robust and secure network, the core product of the sectors would be minimized. Data access layers are critical for the quick turnaround of other dimensions such as the analytical and decision support functionalities of the entire ICT ecosystem.
- **Data Analytics** is important in order to make good use of the underlying information in the ICT ecosystem. Businesses and organizations depend on a powerful data analysis that provides ready and consumable information even for the person with no information technology background. These data analytics systems require a very powerful infrastructure that can crunch the underlying data by the second while keeping the stamina for very long-spans of operations.
- **Decision Support System** in the ICT integration ecosystems takes the analyzed data beyond just information and provides decision templates for the would-be users and decision-makers for a quick and decisive decision-making process.
- **Value Addition Services** offer a beneficial outcome from ICT integration to businesses and organizations. Through intelligent data manipulation, information that provides the value addition component of the ICT integration is a potential area that can benefit businesses and organizations to make decisions on how ICT is advanced for the betterment of society and the economy.

[5] https://ardhisasa.lands.go.ke/home
[6] http://portal.nema.go.ke/_layouts/NEMAFBA/login.aspx
[7] https://digischool.go.ke/

Box 2.2: Skills dimension clusters that will be required by the various sectors

- ***FinTech sector:*** Skills Dimension cluster needed in FinTech sector include data storage, data accessibility, data analytics, decision support systems, and value addition services. Financial transactions are a sensitive component in this sector. The skillset needed would be those that can enable secure, fast, and trustworthy transactions that are auditable. Therefore, skills that related to data security, data storage, data accessibility are key. In addition, decisions need to be made that would shape the future of any industrial player in the sector, and as such, skills such as cybersecurity and cloud computing come into the picture.

- ***Manufacturing, Building, and Construction sector:*** Skills Dimension cluster needed in this sector is projected to include data storage, data accessibility, data analytics, decision support systems, and value addition services. Automation and robotics involve massive data calculations and expertise to ensure precision-related processes. Skills that will enable the development and management of robotic systems are therefore paramount in this sector.

- ***International Trade sector:*** Skills Dimension cluster needed is projected to include data storage, data accessibility, and data analytics. The sector appears to depend heavily on skills that relate to data storage, data accessibility, and data analytics to help in the e-commerce business and enable the transaction. Skills in data security are also crucial in this field due to sensitive and private issues that are embedded in such a sector.

- ***Transport & Infrastructure sector:*** Skills Dimension cluster needed is projected to include data storage, data accessibility, data analytics, decision support Systems, and value addition services. To have enough skills to manage the increased data storage and data accessibility needs, experts in cloud computing will be needed in this sector. Professionals with AI/ML will also be needed to contribute to developing and managing decision support systems for the sector as well as capabilities to inform on value addition.

- ***Health sector:*** Skills Dimension cluster needed is projected to include data storage, data accessibility, data analytics, decision support systems, and value addition services. The increased role of health informatics implies that more data scientists and bioinformatics professionals will be needed to drive the sector. Just like the other sectors, data security, data storage, and accessibility would also need corresponding skills for the sector.

- ***Agriculture, Forestry & Land management sector:*** Skills dimension cluster needed is projected to include data storage, data accessibility, data analytics, decision support systems, and value addition services. The growth of the application of Bigdata means that skills needed in this sector will depend a lot on skills that can handle data storage, data accessibility, and data analytics in addition to having skills to develop decision support systems. Value addition services also will require the skills to understand how IoT can be optimized to add value.

- ***Energy sector:*** Skills Dimension cluster needed is projected to include data storage, data accessibility, data analytics, decision support systems, and value addition services. The energy sector needs a lot of data scientists who can work in the data storage, data accessibility, data analytics dimensions of the skillset. In addition, having the computing skills for decision support systems is also a perceived skill to have.

- ***Education sub-sector:*** Skills Dimension cluster needed is projected to include data storage, data accessibility, data analytics, decision support systems, and value addition services. The education sub-sector needs all the skills to be able to have the capacity to transfer knowledge in a digital talent cultivation ecosystem. The skills to manage data storage facilities, networking skills for data access, and computing skills to be able to develop decision support systems and value addition systems are also needed.

[8] https://www.oecd-ilibrary.org/governance/government-at-a-glance-2019_93c6d805-en
[9] https://www.cio.com/article/3606151/what-is-data-analytics-analyzing-and-managing-data-for-decisions.html
[10] https://www.investopedia.com/terms/d/decision-support-system.asp
[11] https://www.oecd-ilibrary.org/science-and-technology/ict-value-added/indicator/english_4bc7753c-en

### 3. Current and future demand for ICT technologies

Finding 3: Big data analytics, application and web enabled markets, Internet of Things, Machine Learning, cloud computing, virtual reality, encryption and new materials are the top technologies likely to be required now and in the near future.

According to Santora (2019), the most-rare skills that are in demand, and which can be associated with the gaps in Kenya are big data/analytics that stood at 44%, which was followed closely by cybersecurity at 39% and AI at 38% (Santora, 2019). This means that data security, data analysis and processing, and value addition through the incorporation of AI/ML would be a natural skill demanded by most of the economic sectors. The survey further found that 45% of companies employed outsourcing to access skills while 37% used outsourcing to increase scale and 41% planned to increase outsourcing of the skills into their workforce (Santora, 2019). Similarly, an analysis by the World Economic Forum 2020 report surveyed global employers, collectively representing over 15 million employees showed that 70-85 % of the companies interviewed will have adopted cloud computing, machine learning, the internet of things, app-web enabled markets, and user and entity big data analytics by 2022 (Table 2.7)

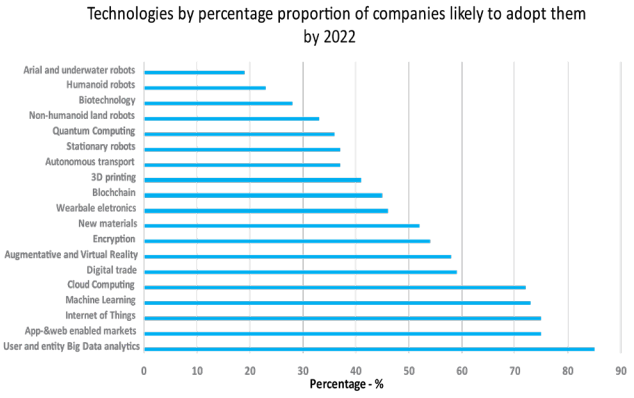



Figure 2.7: Illustration of Technologies by a proportion of companies likely to adopt them by 2020 according to World Economic Forum 2018

The latest (2020) World Economic Forum Future of Work report shows cloud computing, big data, IoT and connected devices remain high priorities amongst the technologies that companies are likely to adopt by 2025. These follows the trends reported earlier, e.g. WEF 2018. However, there has also been a significant rise in interest in the number of firms expecting to adopt non-humanoid robots and artificial intelligence, with both technologies slowly becoming the mainstay of work across industries. These new technologies will drive future growth across industries as well as increase the demand of new job roles and skills.

### 4. Which companies require which skills

Finding 4: There are two main sources of demand for ICT – traditional employers, which consists mainly of larger corporations and government, and non-traditional employers such as start-ups, self-employment/entrepreneurs. The approach of these two categories to ICT talent recruitment and training is different. This difference needs to be understood in the context of talent cultivation.

Traditional employers with larger Information Technology (IT) departments tend to look for more traditional IT skills, centered on administration. They usually look for packaged solution and customized applications. Non-traditional employers tend to be more receptive to innovative IT use than large establishments. They need people that can build internet applications, cloud computing, and develop systems from scratch. Corporates have the capacities to train IT graduates, and can take in entry-level and intermediate developers since they have larger teams that can offer mentorship and guidance. Companies usually pick fresh graduates from universities and use in-house IT staff to upskill new employees with knowledge specific to the needs of the organization. Start-ups usually prefer to recruit new staff with experience who can immediately create a product within tight timelines (Mercy Corps 2019).

### 5. Impact of Covid-19 pandemic on the adoption of ICT technologies

Finding 5: The digital economy has been the major beneficiary of the Covid-19 pandemic. This is because most companies are likely to invest more resources on digitalization of their work processes and automation of tasks and provide opportunities to work remotely as strategies for adaptation to the new normal. This will lead to increased demand for ICT skills.

The 2020 World Economic Forum Report on future of jobs, prepared in the context of the Covid-19 pandemic indicates that the pace of technology adoption will remain unabated; Covid-19 pandemic appears to have accelerated the arrival of the future of work and increased the velocity and depth

of the long-term changes already triggered by the Fourth Industrial Revolution (4IR); and that the future of work has already arrived for a large majority of online workforce. Some of the key projections based on the WEF (2020) report are:

**a)** Early evidence from WEF Future of Work Survey suggest that in addition to the labour market displacement caused by Covid-19, employers are set to accelerate the automation agenda. Amongst the business leaders surveyed, over 84 % report that they are expanding automation of their work processes; 83% indicated that they are increasingly adopting remote working while 50 % indicated that they are set to accelerate automation of jobs in their companies (Figure 6).

**b)** It is projected that whereas by 2025, some 85 million jobs may be displaced by a shift in division of labour between human and machines, 97 million new roles may emerge that are more adapted to the new division of labour between human, machines and algorithms.

**c)** The report shows that skills gaps in the labour market and inability to attract the right talent remain among the leading barriers to the adoption of new technologies. In the absence of ready talent, 62 of the companies will prefer reskilling and upskilling of their workforce.

**d)** Online learning and training is on the rise but looks different for those in employment and those unemployed. There has been a 400% increase in the numbers of individuals seeking out opportunities for learning online and a 500% increase in employers' provision of online learning opportunities to their learners, and a corresponding 900% enrolment increase for learners accessing online learning through government programmes.

### 6. The number of ICT job opportunities that will require to be filled

Finding 6: There is limited data in Kenya on expected requirements in terms of ICT skills between now and 2030, though indications are that the number will go up. There are projections that the demand for digital skills will reach about 32 million by 2030, out of which 21 million will be foundational, 1.9 million intermediate and 1.3 million advanced. An additional 8 million digital skills will be required from occupations outside ICT specialties and will be generated by enterprises adopting digital technologies.

Whereas it is not easy to come up with exact numbers of the ICT jobs that will be required between now and 2030, there are useful projections that can give indications of what to work with. A labour market analysis from IFC and the World Bank showed that by 2030, 50-55% of jobs in Kenya will depend on digital skills, up from 25-30% in 2019 (Caballero & Bashir, 2020). Agriculture will account for 35-40%, industry 45-50% and services 60-65 % (Figure 2.8). Cumulatively some 32 million ICT skills training opportunities will have been created by then, 21 million will be foundational, 1.9 million intermediate and 1.3 million advances. The majority of the demand for digital skills (8 million) will be from occupations outside ICT specialties and will be generated by enterprises adopting digital technologies, e.g. accountants learning accounting software packages.

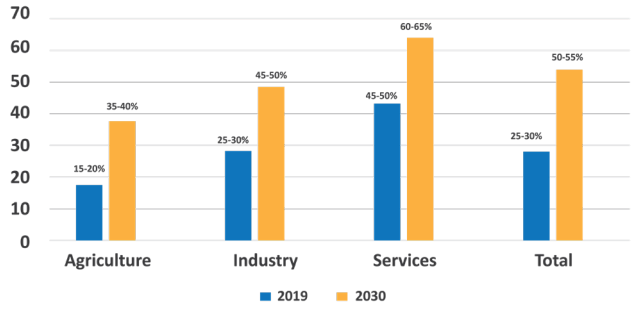



Figure 2.8: Estimated rate of adoption of digital technologies in Kenya (2019 and 2030)

### Some statistics about the number of ICT jobs opening currently and in the future

a. Recent research projects that by 2030, over 230 million new jobs will be created in Sub-Saharan Africa which will require ICT professionals, and that an estimated $130 billion investment opportunity lies in digital skills cultivation in Africa (The World Bank Group, 2019).
b. The mobile technologies and services are a major contributor to job creation in the ICT sector, with one report estimating that some 1.7 million for formal and informal jobs directly as a result of mobile technologies and services (Mercy Corps 2019).
c. It was estimated that by the end of the year 2020, Kenya's ICT sector, through the information technology-enabled services, would have generated 250,000 jobs in addition to contributing up to 8% of the country's GDP, (The International Trade Administration 2020).
d. Currently 18.4% of all formal sector employment occurs in occupations with high ICT intensity, in comparison to 6.7% in Ghana (World Economic Forum 2017)
e. Kenya is becoming an emerging hub for the global digital business process outsourcing (BPO) sector, where roughly 7,000 Kenyans work in BPO, mostly in voice-based services and transaction back-office services (WEF 2017). Most outsourcing jobs come from US, whose companies use Kenyans due to low wages and high-quality work. Growth of BPO, online work and digitalization is driving demand and creating jobs. By 2025, some 537,000 additional jobs will be created contributing US$ 3 billion to Kenyan GDP (WEF, Future of Jobs and Skills in Africa)

## 2.2. SUPPLY ANALYSIS FOR TALENT CULTIVATION

### 2.2.1. Analysis of the Kenyan ICT's Education

The situation analysis of the Kenyan ICT's industry education is analyzed taking into consideration the three levels of skills required by the market:

a. Basic digital skills that enable beneficiaries to access services such as web research, online communication, use of professional online platforms and use of digital financial services. It assumed that the basic digital skills will target the general Kenyan population to be able to take advantage of the digital economy, irrespective of the level of education and professional orientation. Taking into consideration that only a small percentage of the Kenyan students transit from secondary school to tertiary institutions, it is assumed that the provision of basic digital skills should take place at the basic education level in order to prepare a future generation that is digitally literate.
b. Intermediate digital skills (digital graph design and marketing, desktop publishing and social media management) target IT professionals that can work in ICT industries, middle and upper-level positions and Technical and Vocational Training institutions (TVETs)
c. Advanced digital skills (technology development; network management, machine learning, big data analytics and IoT) target professionals that would normally have graduated from universities with ICT related degrees.

This analysis has therefore focused on the provision of training at basic education, TVETs and University levels. The following are the key findings from the analysis:

**1. Basic Education/Foundational skills**

Finding 1: Competency-Based Curriculum is a big opportunity to enhance ICT education at Basic Education level.

The recently introduced Competency-Based Curriculum (CBC) has the potential to enhance ICT training at primary school level. CBC has been designed to replace the old 8-4-4 system which has been in place since 1985. This new curriculum distinguishes itself by defining the minimum standards of achievement for every level and ensures that every learner gets the opportunity to acquire the necessary competencies and receive the proper guidance to progress to the next level. Learners will be equipped with a quality education that entails inculcating initiative, creatively innovating products and processes. It is envisioned that this will lead to the development of values and talents that can keep up with rapid technological changes including digital skills. Instructors will implement the curriculum by incorporating ICT to enhance innovation by:

According to the Kenya National Bureau of Statistics (2020), number of schools and pupils are as follows
a. Primary schools = 32,344
b. Secondary schools = 10,463
c. Pupils in primary schools = 10.1 million
d. Pupils in secondary schools = 3.3 million

a. Designing digital content that is appropriate for the entire curriculum and includes Special Needs Education (SNE) learners.
b. Identify and procure the necessary technology that is appropriate for the Competency-Based Curriculum
c. Establish digital instructional methods in such a way that it caters to diverse learning styles and builds the capacity of curriculum implementers.

It is envisioned that CBC provides a great opportunity for enhance awareness and training of basic digital skills at basic education level. First, the deployment of ICT for teaching and learning in the classroom as well as through distance mode will encourage experiential learning, creativity and innovation at the same time improve quality and access to sound learning. Secondly, the ICT skills and knowledge of teachers can be improved and upgraded by adopting technology in pre-service and in-service training programs. This will prepare them better to impart ICT skills to their students.

Finding 2: There has been progress in building ICT Readiness at primary schools particularly, but overall there are still challenges across Basic Education.

The main challenge of providing basic digital skills in primary and secondary schools is their low level of ICT readiness. By 2021 the numbers for primary schools are likely to have increased somewhat thanks to the DLP, however the most recent comprehensive data is from The Kenya Institute of Curriculum Development who conducted a nationwide baseline survey in 2018 to determine the availability of ICT devices in schools and the number of teachers trained on ICT. The study results indicates that only 24% have access to tablets; 19 % have access to laptops, 27% have access to desktops and only 34.5 % of the respondents have had ICT training. This implies an urgent need for digital talent skills training in this sector of the education system. Additional challenges included:

a. Access to tablets: 24%
b. Access to laptops: 19%
c. Access to desktops: 27%
d. Access ICT Training: 34.5%

a. Skilled ICT teachers were scarce. Most secondary school instructors lacked the skills necessary to promote the use of ICT in schools.
b. Due to a lack of sufficient exposure during formative training in initial teacher training institutions, the bulk of teachers' ICT training was far from satisfactory. Teachers did not have adequate time to practice using ICT tools during in-service courses because they were trained through seminars and conferences.
c. Lack of adequate funds for ICT adoption: Schools lacked sufficient money for ICT adoption in pre-schools, classrooms had not been rebuilt in preparation for ICT adoption, computer laboratories had not been established, and KICD had not provided book guides for ICT adoption.
d. The school's ICT policies did not prioritize the provision of ICT services and their accessibility; the regulations were not apparent to everyone, and they did not advocate for compliance with health and safety regulations for both teachers and students, posing a significant barrier to ICT adoption.

The Education for Sustainable Development Policy (2017) for the education sector also recognizes that majority of teachers are ill equipped to effectively integrate ICT in the classroom. According to the policy, the main challenge for teachers include lack of adequate number of computers, educational applications, training, policy and strategy on how integration should be done.

## 2. Technical and Vocational Training Institutions

In 2020, the total number of Technical and Vocational Education and Training (TVET) institutions increased by 7.5 % from 2,140 in 2019 to 2,301 (KNBS 2021), while the total enrollment increased by 4.8 per cent from 4,306,000 reported in 2019 to 4,512,000. The distribution of these institutions are shown in Figure 2.9.

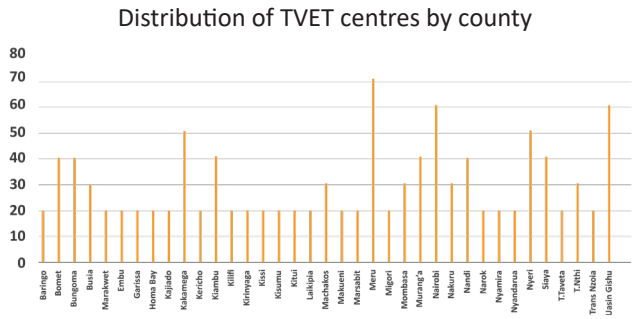



Figure 2.9: Summary of aggregated TVETTA centers per county

**Using ICT in TVET Education and Training (smart classroom)**

Finding 3: There are already efforts to enhance the application of ICT to improve training and pedagogy in TVET institutions. This will not only contribute to improved quality of training of TVET graduates including ICT professionals but also increased appreciation of ICT by non-ICT oriented disciplines.

The Technical and Vocational Education Training (TVET) strategic plan (2018-2022) recognizes the importance of deploying ICT in the following aspects: Rapid change in technology and its impact on skills development, technological and skills requirements for mega-projects, culture of innovation, creativity and maintenance, use of ICT in delivery of government and other services, Competency-based education and training as catalyst of improvement of TVET, and use of ICT in education and training (e.g. smart classrooms). According to the policy, the introduction of Smart Classrooms at the Kenya Technical Trainers College (KTTC) and 9 technical training institutes has introduced a unique TVET teaching and learning concept in Kenya, combining state-of-the-art technologies, software, simulations, experiments, and hands-on practical education. The approach maximizes on the use of existing equipment at the workshops, through presentations, digital lessons, investigations, on-screen simulations, virtual experiments, practical exercises, project and group work. It changes trainees and instructors' mind-sets and brings innovation, spurs creative and catalytic thinking, triggers trainees' exploration skills, enhances problem solving based learning, and provides the opportunity to teach and learn design, programming and production skills.

**Adoption of e-Learning in TVET Institutions**

Finding 4: The level of adoption of e-Learning as a method of teaching in TVET is still low in Kenya. Although there is a standard to guide the roll-out, there are several challenges that need to be addressed.

In Kenya, the adoption of online learning as a method of teaching has been slow, especially amongst TVET institutions largely due to a lack of an established legal framework and standards to guide a proper roll-out. The Technical and Vocational Education Training Authority (TVETA) has developed the standards that set the requirements and guidelines for the implementation of Open, Distance, and e-Learning (ODeL). These standards, which have been developed through consultations with stakeholders and the Kenya Bureau of Standards (KEBS), were necessitated by the need for establishing requirements governing the quality of training services in the TVET sector (TVETA, 2020). The TVET Standard prescribes requirements for Open, Distance, and e-Learning centres through traditional distance education; e-learning provisions; blended learning, and virtual education and training modes.

The implementation of e-Learning in TVET's is faced with multiple challenges. Some of the concerns reported by TVETA (2020) are intermittent internet connectivity for staff and students in regions with 2G or 3G cellular networks, which affected download speeds on off-campus computers and mobile devices. Students and staff also had concerns about the high cost of internet connectivity, limits to the number of participants per session while facilitating synchronous sessions using free versions of online meeting platforms, limited access to computers while at home, frequent electricity blackouts, ICT literacy skills and, high-cost licenses for operating systems. The challenges reported on pedagogical aspect include learner support; inclusive pedagogies; integration of gender aspects; accessing, using and curating open educational resources (Njoka, Githui, & Ndegwa, 2020).

### 3. University Education

**Inadequate number of graduates compared to the demand**

Finding 5: There may not be enough ICT graduates produced by Kenyan local universities compared to the demand. On average around 5,000 ICT graduates are produced yearly against a minimum demand that may reach around 25,000.

Currently there around 63 public and private universities in Kenya. The Commission for University Education has classified university programs into five levels namely: Doctorate, Masters, Post Graduate Diploma, Bachelors, and Diploma. University programs have been classified into ten (10) fields or clusters of education and training adopted from the International Standard Classification of Education (ISCED). Information and Communication Technology (ICT) is recognized as a cluster of education, among the 10 that have been identified.

In 2018, the 31 Public Chartered Universities reported that ICT courses accounted for 176 programs out of a total of 4972 programs in these universities (Table 2.7). That translates to 4.33% of their total course offering across the five levels as shown in table 7. In the same period, the 32 private universities which are made up of 18 Private Chartered universities and 14 Private Universities with LIA (Letter of Interim Authority) reported that ICT courses contributed 70 programs (9.25 %) and 25 programs (17.4 %). About 547,700 students were enrolled in Kenya during the academic year 2020/21, 81% being in public universities (Julia Faria, 2021). Since most of the courses are 4-5 years long, it can be assumed that around 100,000 students graduate per year and at 4.33 % admitted to ICT related courses and taking into consideration the contribution of the private universities, then about 5000 ICT students can graduate per year. This estimation is closer to the projection of 5874 provided by (Mercy Corps 2019). This compares poorly with what the market requires.

| Clusters | Number of programmes in ICT | | | | | | Total no of programmes | % Proportion |
|---|---|---|---|---|---|---|---|---|
| | PhD | Masters | PGD | Bachelors | Diploma | Total | | |
| Public Universities | 20 | 31 | 3 | 99 | 23 | 176 | 4061 | 4.33 |
| Private Universities | 4 | 16 | **9.25** | 37 | 13 | 70 | 757 | **9.25** |
| Private Universities LIA | 0 | 0 | **17.4** | 12 | 13 | **25** | 144 | **17.4** |

Table 2.7: Summary of ICT programs offered in public and private universities in Kenya (adapted from CUE 2018)

**Lack of Women studying ICT**

Finding 6: The low number of women in ICT courses (estimated around 30%) reduces the potential labour pool, and hinders women's empowerment and opportunities in this fast-growing field.

There is a lack of girls and women applying for, studying, and graduating in technology which therefore reduces the number of students in the overall market and reduces opportunities in this fast-growing sector to women, hindering their empowerment and job prospects. In Kenya STEM participation shows a clear gender disparity ranging from 30%-35% of the student base. Fewer women apply, participate and even fewer complete their studies compared to males. In addition, their graduation scores are low compared to those of males[12].

An African Academy of Sciences study in 2020, Factors which Contribute to or Inhibit Women in Science, Technology, Engineering, and Mathematics in Africa (Mukhwana A.M, Abuya T, Matanda D., Omumbo J., & Mabuka J., 2020), identified patriarchal attitudes, values and beliefs as key barriers that inhibit women from pursuing STEM careers on the continent. According to the study, 75% of interviewees, which included top women researchers, mid-level women STEM personnel and university students, were of the opinion that negative traditional beliefs that women were inferior to men are contributing to women's lack of strong enthusiasm for STEM studies at tertiary level. An older study (Mbirianjau, 2016) identified gender stereotyping, sexual harassment and family responsibilities as barriers. Gender biases were not only revealed in inequality in enrolment and completion but also in policies that favoured male students in STEM disciplines.

**ICT Skills not up to scratch**

Finding 7: The supply of the ICT professionals do not have the necessary skills to meet demand due to lack of demand driven curricula and practical exposure of faculty as well as inadequate industrial attachment and internship opportunities.

The ICT skills mismatch remains a major challenge for the ICT sector. A survey report that interviewed 3600 IT leaders of global status confirmed that demand and supply mismatch in the ICT job market is the biggest concern in economic sectors like Kenya. It is not easy for the ICT industry to get the right talent when they are require (Mercy Corps 2019). The skill gap and the mismatch challenge provide an opportunity for stakeholders to seek ways of addressing the gaps through digital talent cultivations and other means necessary to improve digital literacy and digital proactiveness in readiness for a full-blown digital economy in Kenya. There are four main reasons cited for this mismatch (Mercy Corps 2019, MICT 2017, National ICT Policy 2019; National ICT Master Plan 2014-2017): These are faculty driven curricula, inadequate demand information by the Kenya Labour Market Information System, inadequate funding and opportunities for industrial attachments and internships and weak academia-industry collaboration.

**1. Faculty Driven Curricula**

There is disconnect between academia and the private sector, with universities offering curricula and teaching practices that are not aligned with the needs of the job market. Universities are developing a workforce that is neither guided by a human resource development policy, nor well aligned to the industry needs, especially at the higher end of the spectrum (MICT 2017). With a rapidly growing ICT sector, most universities are slow to catch up with evolving demand for IT skills an emerging technology, which forces graduates from these universities to teach themselves. According to a participant in a validation workshop, even where universities wish to quickly review their curriculum based on feedback from interaction with industry, the Commission for University Education must approve the curriculum, a process which is considered slow. Furthermore, most ICT faculty do not have industry experience and only a few have PhD degrees (Mercy Corps 2019).

[12] https://theconversation.com/why-fewer-kenyan-women-are-choosing-or-completing-stem-courses-91706

**2. Weak Labour Market Information System (KLMIS)**

The Kenya Labour Market Information System (KLMIS), was established in 2017 and serves as a Labour Market observatory/ intelligence/ watchtower for the economy through the provision of timely, relevant, and reliable labour market information[13]. KLMIS has been providing regular information on the labour market in Kenya including labour demand trends, labour supply, labour market services and training services. KLMIS has also been conducting surveys on relevant labour market issues key of which include the informal sector in Kenya. However, KLMIS faces the following key challenges: inadequate funds to undertake research, data collection and sectoral surveys; weak collaboration and networking among stakeholders; lack of facilitative legislation to enforce production and regular remittance of LMI from institutions; and weak Information Management Systems in stakeholder institutions[14]. There are no clear assessments of the kinds of skills needed for different types of workers in different sectors, even though this is necessary to inform training programs for such workers.

**3. Inadequate funding and opportunities for Industrial Attachment and Internships**

Most institutions acknowledge that the Industrial Attachment (IA) experience is meant to: facilitate the trainee to develop awareness on the requirements of the world of work, enhance already acquired work related skills which include social skills, have a hands-on experience with modern technology in whichever workplace a trainee serves, as well as, make a personal connection between theory and practice (Mihail, 2006; kiplagat, Khamais and Karei 2016). Industrial attachments can also benefit the industry. It has also been found that organisations that attach trainees/students do gain in four ways: Fulfilling Corporate Social Responsibility (CSR), Gaining New Perspectives and Technologies (NPT), Cost Savings (CS), and Corporate Image Enhancement (CIE) (Mgaya & Mbekomize, 2014). Studies show that students also improve in their use of technologies, ability to take criticism, and to see the bigger picture (Andrews & Higson, 2007; Andrew and Higson, 2008; Hall, Higson and Bullivant, 2009).

However, there are challenges that need to be addressed to make industrial attachments effectively contribute to talent cultivation. For example, a study by Langat, Omboto, Ambuli and Ngeno (2021) found that the majority of students find their own industrial attachments and only 5% of the students received placement through their respective departments. This indicates that when it comes to placement of prospective trainees there is very little involvement in the teaching department. Many students in TVET institutions face the problem of lack of funds for transport while searching for organizations, having inadequate working space for trainees on attachment, lack of knowledge on how the industry operates, stringent requirements and scarcity of industrial attachment opportunities[15] (Aineah, 2019). Like industrial attachments, opportunities for internships in the private sector are also fewer than the demand. Most internship opportunities are currently offered by the public sector thanks to the Presidential Digital Talent Programme, PDTP, though that programme also tries to place the programme's 400 students each year into private sector attachments if possible (National ICT Policy 2019; National ICT Master Plan 2014-2017). At a national level, the PDTP, which is a 1-year programme after graduation, is seen as quite successful, but it is not enough, with a need for more opportunities during studies, more opportunities for TVET students, and more local opportunities.

**4. Weak Academia-Industry collaboration**

Tertiary institutions in Kenya collaborate with industry in various ways including curriculum development, student placement, staff engagement and consultancies, innovation, and community-based initiatives. Universities also partner with communities and industry to customize work-integrated learning curriculum that has the potential to achieve productive outcomes by allowing learners to contextualize study content within the socio-cultural and functional environment of the industry or community[16]. In some universities, the strategic plans dedicate complete chapters to the subject of partnerships while in some, the units that manage partnerships have specific plans on the agenda of partnerships and collaborations[17].

A number of institutions have set up incubators, accelerators, and hubs with varying success, and private sector-led research hubs have increasingly been strategic (e.g. IBM Think Lab). The Chandaria Business Innovation and Incubation Centre of Kenyatta University hosts entrepreneurship programmes that have strong links with industry. Jomo Kenyatta University of Agriculture and Technology is engaged with the Nairobi Industrial and Technology Park, providing infrastructure that supports growth companies[18]. Maastricht School of Management (MSM) is part of the Kenya Industry and Entrepreneurship Project (KIEP) together with linking Industry with Academia (LIWA) and The Kenya Private Sector Alliance (KEPSA) to increase productivity and innovation in selected private

[13] https://www.labourmarket.go.ke/

[14] https://wapes.org/fr/system/files/nairobi_2017_muraya_en.pdf

sector firms[19]. In addition, the Kenya Education for Employment Program (KEFEP) is an initiative focused on strengthening and supporting technical and vocational education and training (TVET) in Kenya in partnership with the Kenyan Ministry of Education (MOE) and in collaboration with key industry representatives[20]. Despite the above-mentioned successes, the level of university-industry collaboration is rated weak due to several barriers. These include absence of policies for incentivizing partnership efforts in the universities and lack of institutional and national support structures to coordinate establishment of such partnerships[21]. It also appears that these above examples are the exceptions rather than the norms, and even for these cases, there seem to be few concrete outputs, such as commercialization, or research.

**e-Learning boom from covid-19 pandemics**

Finding 8: The Covid-19 pandemic has renewed interest in e-learning, and therefore provides opportunities for expanding access to ICT training; however teaching capacity remains a challenge and lack of affordable connectivity and devices amongst most students is also a bottleneck.

The 2020 report of the World Economic Forum on the future of Jobs projects a significant rise (4 to 9 fold) in demand for online learning and training, as an adaptation strategy for employers and employees to the new normal created by Covid-19. This provides a unique opportunity for Kenyan universities to expand outreach and access to ICT training. Whereas there is a positive move to strengthen e-Learning in Kenya's institutions following the Covid-19 pandemic, the KICD content has made progress, private sector companies have started up, and some Universities have set up e-Learning or ODEL systems and platforms, on the whole the following challenges, previously identified as bottlenecks to e-Learning in our universities (Tarus, Gichoya, and Muumbo, 2015), are still relevant:

a. Kenya lacks a clearly defined national e-learning policy framework to guide the practice, and therefore the practices are guided by individual organization's policies and the new ICT policy of 2016 which gives broad e-learning strategies As a result, Kenyan state-sponsored universities were unable to deploy e-learning due to a lack of proper policies as well as financial limitations and lack of relevant ICT infrastructure.
b. There are inadequate technical skills to develop e-content on the part of e-tutors and overemphasis on the technical functionalities of the system as opposed to the eLearning pedagogical training, which is the main challenge for most public universities.
c. Most tutors are pessimistic and want to avoid the platform altogether because they feel that ICT's will replace their tutoring jobs.
d. Other challenges that hamper e-learning are lack of priority in ICT funding, pressure due to poverty and ICT sustainability. To adequately promote e-learning in Kenya's education system these problems need to be solved.

[15] https://ir. library.ku.ac.ke/bitstream/handle/123456789/18872/Strengthening%20University%20Partnerships
[16] https://ir. library.ku.ac.ke/bitstream/handle/123456789/18872/Strengthening%20University%20Partnerships
[17] Ibid
[18] https://www.tandfonline.com/doi/full/10.1080/20421338.2020.1796012
[19] https://www.msm.nl/news-events-and-blogs/news/the-kenya-industry-and-entrepreneurship-project?
[20] https://www.collegesinstitutes.ca/what-we-do/international/education-for-employment/kenya/
[21] http://ir-library.mmarau.ac.ke:8080/xmlui/bitstream/handle/123456789/3197/

### 2.2.2. Analysis of the existing initiatives by government, development partners and private sector that support talent cultivation

There are several initiatives targeting talent cultivation currently being implemented by the government, private sector and development partners. Some of these initiatives have been reviewed. For the purpose of this analysis, these initiatives have been grouped into eight categories – basic ICT skills and digital literacy; intermediate skills and advanced skills; internship, industrial attachment and mentorship; certification; trainers' development; talent absorption and job placement, entrepreneurship and self-employment; and funding (Figure 2.10). The analysis has focused on adequacy and the extent to which they contribute to addressing the challenges identified in each of the seven categories.


Figure 2.10: Initiatives by the government, private sector and development partners that have been reviewed.

The main findings are briefly discussed below:

**1.Initiatives that support the development of basic (foundational) ICT skills**

Finding 1: Significant efforts are being made to enhance basic ICT skills and digital literacy, by both the government and the private sector. The government's two initiatives are large and impactful and could be upscaled. However, the scope and extent of involvement of the private sector and development partners in talent cultivation in basic ICT skills is still low.

Under this category, four initiatives were reviewed – Digital Literacy Program, DigiTruck, Learning Lions and Digital Learning and Skills Initiative. These initiatives support talent cultivation at basic level, providing basic ICT skills, targeting primary schools, unemployed secondary schools' dropouts, civil servants as well as upskilling those who lost employment due to Covid-19. They are briefly discussed below:

a. **The Digital Literacy Program:** The Digital Literacy Program (DLP) is a Government of Kenya driven program aimed at ensuring that every pupil is prepared for today's digital world and to transform learning in Kenya into a 21st-century education system (ICT Authority, Kenya, 2019). The program is being implemented in three phases. Phase one, which started in 2016, involved installation of digital devices in Kenyan public schools alongside an initiative to provide all schools with electricity. More than 1 million devices were installed in public primary schools across the country, with more than 100,000 devices assembled locally in Kenya. The second phase will focus on exposing learners to technology and concepts for learning to enhance creativity and innovation. Under this phase, a 'Shared Digital Learning Resource Centre" will be set up in schools with appropriate infrastructure and tools. The third phase will focus on the use of technology for employment creation. During this phase, advanced labs with tools to enable the designing and prototyping of products will be set up in universities and TVETs. In phase one, as well as the devices (tablets for students and laptops for teachers), each school was given a device that could host content and be accessed by Wi-Fi from the devices (though few of the schools were connected to the internet so far, there is an intention to do so), and teachers were provided some training.

b. **DigiTruck:** This was launched in 2019 by Huawei together with UNESCO, Safaricom, GSMA, the Ajira initiative under the Ministry of ICT and NGO partners,

Close the Gap and Computers for Schools Kenya. It is a mobile classroom that travels to remote areas providing youth with 20-40 hours of training on how to use computers, how to use the internet and how to use the internet to find jobs, trade, study online and be safe online. In its first two years of operations 2,154 people from 16 different locations or counties across Kenya have been trained so far and 38,102 hours class time provided.

c. **Learning Lions:** This program began in Turkana County, North Kenya, in 2015 and it aims to equip students with IT and media skills, who are then encouraged to become entrepreneurs through selling digital services online, become self-sustaining and can even employ new cohorts of trainees. It is being supported by a Non-Governmental Organization (NGO).
d. **Digital Learning and Skills Initiative:** This is an Initiative by the Ministry of Industrialization, Trade, and Enterprise Development in partnership with Microsoft and Stanbic Bank. The project aims to enhance employability of individuals (mainly youth) who have lost their jobs during the Covid-19 pandemic through digital upskilling. The program was rolled out across various counties and expects to employ 2,000 youth by the end of 2021.

The four initiatives, (particularly the Digital Literacy Program and the Digital Learning and Skills Initiative) have the potential to make significant contribution to enhancing digital literacy to the general population, which is key to driving the digital economy in Kenya as shown by the various readiness assessment reports discussed in section 2.1. The digital learning and skills initiative, due to its focus on upskilling individuals who have lost jobs due to Covid-19 pandemic remains strategically important now and in the future. Other programs in this space include the Google Digital Skills for Africa and various programs offered by eMobilis through the Ajira platform.

**2.Initiatives that support the development of intermediate and advanced ICT skills at university level**

Under this category, 22 initiatives have been reviewed. The findings are presented under the following categories: curriculum development and upskilling of ICT Lecturers; certification; internships, industrial attachments and mentorship; job placement and Incubation for self-employment. The key findings are discussed below:

**Curriculum and Upskilling of ICT Lecturers**

Finding 2: There are several initiatives aimed at strengthening university-industry collaboration in ICT curricula and training to ensure that industry driven curricula and practical oriented pedagogy are in place to produce ICT graduates ready for the market as well as those that focus on upskilling ICT lecturers. However, the few that exist need to be reviewed and upscaled.

Under this theme, the following three initiatives were reviewed:

a. **Center of Excellence (COE):** Under the Center of Excellence (COE), which is based at the University of Nairobi and aims to train 5,000 students every year to be adequately prepared for employment in the Business Process Outsourcing/Information Technology Enabled Services (BPO/ITES) industry. The COE is a partnership involving leading Kenyan (BPO/ITES) Services companies and their global counterparts, together with the Kenyan academic community. This makes the COE curriculum beneficial to ICT developers and entrepreneurs who wish to increase their competencies in best-in-class practices in the industry (ICT Authority, Kenya, 2020).
b. **Microsoft ICT Skills Training:** Various institutions and organizations have created platforms and programs of training and certifying of trainers/ tutors, empowering them to train others. The Microsoft ICT Skills Training program was started in 2015 with a view to creating a platform that would allow up to 300,000 instructors to be trained on ICT. Competency in Microsoft Technologies, Microsoft Teach with Technology courseware, and certification as Microsoft Certified Educators were among the proposed areas of training.

These two initiatives are unique in various ways. The Centre of Excellence (CoE) targets a specific sector (BPO) of the ICT industry. Secondly, the collaboration leads to the development of an industry driven curricula. The Microsoft ICT Training program focuses on ICT trainers. These initiatives are crucial in bridging the gap between supply and demand for ICT skills.

**Certification:**

Finding 3: Training and Certification of ICT professionals by private companies is a new approach of talent cultivation in Kenya, which provides a significant potential for job placement and self-employment and should be encouraged.

Under certification, the following four initiatives were reviewed:

a. **SAP Skills for Africa Program:** This program is implemented by SAP (a multinational software corporation) in collaboration with the Kenyan universities, the Ministry of Information and Communication Technologies, and the Kenyan ICT Authority. Through the SAP Skills for Africa program, recent unemployed university graduates in ICT are trained on high-end ICT skills, as well as finance and business development (ICT Authority, Kenya, 2020). The program provides students with the opportunity to train and certify as SAP consultants. The courses undertaken under the program include ERP Foundation, SAP Technical or Functional Training, soft skills, and design thinking.
b. **Huawei ICT Academies:** Huawei is collaborating with over 51 Kenyan universities and other institutions of higher learning to establish Huawei ICT academies whereby institutions have their lecturers trained and can then provide Huawei-certified training for their students. (Huawei, n.d.; ICT Authority, Kenya, 2020)
c. **IBM Skills Academy:** IBM is partnering with Kenyan Universities (e.g. Kenyatta University[22]; and USIU[23]) to establish the IBM Skills Academy to offer certification on new technologies and ICT related services including cyber security, mobile application development; block chain development, big data analytics, cloud computing, and artificial intelligence). The courses are open to students, staff and alumni.
d. **Chipuka Software Development Certification.** This has enabled developers to write and execute high-quality codes through an authentic examination in a supervised setting that tests the skills used professionally by IT companies. It aims to train 500 developers every year.

Certification is an official document attesting to a status or level of achievement. Certification programs in ICT provide a comprehensive understanding of certain competencies and assist beneficiaries in achieving recognized level of proficiencies in certain areas of ICT. When driven by the private sector, certification has the potential to complement university training by bringing in industry perspectives in the curricula. From the four reviewed cases, certification brings several benefits to complement university ICT training. First, certification enhances employability and self-employability of the ICT graduates. For example, some graduates from Huawei certification programs are recruited by the company while those from SAP become SAP consultants. Secondly, some certification programs are offered online (e.g. IBM skills Academy), making them accessible to a wider population.

**Internships, Industrial Attachment and Mentorship**

> Finding 4: Both the government and the private sector have initiated several programs that provide internships, industrial attachments, and mentorship to enhance transition to jobs for graduates and reduce skills mismatch between supply and demand. However, the reach of these initiatives is small compared with the demand for such opportunities by ICT graduates. Furthermore, there are very few initiatives that focus on industrial exposure for Lecturers or use of experts in the ICT industries as part-time Lecturers in universities.

Under internships, industrial attachments, and mentorship, the following three initiatives were reviewed:

**The President Digital Talent Program:** This initiative is being implemented by the Ministry of ICT through the ICT Authority in partnership with several stakeholders in the private and public sector. The main goal of the program is to enhance government ICT capacity at two areas (strategic leadership and technical areas), to develop a pipeline of future talent for government, and to train interns for a period of 12 months. The first cohort had 100 interns and subsequent cohorts have had 400 interns (the sixth cohort has been recruited in October 2021). Under this program, the government provides 10-month internships and private sector partners provide 2-month internships. Private sector partners also provide training and mentorship for students. There is also an innovation competition for the students to propose ideas from, with the winners gaining sponsorship from Huawei to develop their innovations (Huawei are also one of the many partners for the program providing internships and training as well since 2015). The trainees are given opportunities to practice ICT skills, learn to manage ICT-related projects, and gain experience in the ICT sector. In 2021, Huawei provided training to 377 trainees under the Presidential Digital Talent Program (PDTP). It is a five-week virtual training aimed at providing digital training courses on Networking, Cloud, and Artificial Intelligence. Under the program, 246 trainees took the Networking courses while 131 students were trained on Cloud and Artificial Intelligence. A PDTP Advisory Council was established in 2015 but has not been active.

**Huawei Seeds for the Future and Management Trainee Programs:** Through the Seeds for the Future program, Huawei has worked closely with universities and the ICT Authority to provide students with training and internships, in recognition of the importance of providing students with advanced curriculum and work experience opportunities and training (Huawei Kenya, 2018). Each year 30 undergraduates get an internship at Huawei and 10 get further training in China that includes visits to R&D and manufacturing facilities. They also get exposed to Chinese

culture and its ICT industry. So far, more than 100 students have accessed paid internships and 37 students have visited China. On the other hand, the Huawei Management Trainee Program (HMTP), which was initiated in 2018, recruits recent graduates who pursued various engineering courses within telecommunication fields to undertake a six-month internship program in various Huawei departments which include transmission, wireless, IP access, software, and core network. Some 25 students are admitted yearly, with most of them subsequently being able to secure employment with Huawei or with Huawei's partners.

**Oracle e-Government Capacity Building Programme (started 2015):** This program is intended to improve the level of technical knowledge and IT skills needed to deliver e-Government services and to aid Kenya's transition into the digital era. Internships and mentorship opportunities for youngsters are part of the program, as are community-focused business leadership activities and the enhancement of ICT skills development programs and initiatives.

**Job placement and Incubation for self-employment**

Finding 5: There are several initiatives by government and private sector that focus on preparing ICT graduates for job placement and self-employment. These efforts, if well-coordinated and upscaled, can make a major contribution to ICT talent absorption in Kenya.

Under job placement and incubation for self-employment, the following five initiatives have been reviewed:

a. **Huduma Whitebox:** This portal, launched by the Ministry of ICT, provides opportunities to promote talent by enabling Kenyans to pitch their products and get an opportunity to sell their innovative ideas. The program also offers courses for entrepreneurs and execution platforms for projects that can be commercialized. It offers facilities and technical assistance, financial support, access to the market, linkage to the investors and incubation and acceleration when needed. The platform has since acquired 1,125 users, 261 submitted innovations on the big 4 agenda.
b. **Innovation Centres:** Innovation centers that provide training in Kenya have been set up. They offer specialized courses tailor-made to a company-specific requirement. Such institutions like Inceptor Kenya[24], through activities such as providing tech solutions, mentorship, Live-project training and placements have tried to solve the global tech-talent shortage by identifying the untapped brilliant talents and support businesses around the world to build remote teams quickly and cost-effectively through management of tech-solutions for companies in need of these talents to fulfil their growth needs.
c. **Nailab:** This is a Kenyan startup incubator founded in 2010 and launched in 2011 by Nailab Ltd. It incubates technology-based companies and offers 3-6 months of entrepreneurship programs with a focus on growing innovative technology-driven ideas. The incubator aims to lower the entry barriers for ICT entrepreneurs who want to start and scale their businesses in Kenya. This is through providing entrepreneurs with access to critical information, education, contacts, capital, and other resources crucial to the growth of the business that may otherwise be unaffordable, inaccessible, or otherwise unknown to ICT startups in Kenya (Nsehe, 2013, ICT Authority, Kenya, 2020).
d. **The Zindi[25],** based at UoN, is Africa's largest data science competition platform with the mission of building the data science ecosystem in Africa. It hosts a community of over 23 000 data scientists across Africa dedicated to solving the world's most pressing challenges through machine learning and artificial intelligence I. Data scientists come to Zindi to sharpen their skills, build their professional profile, find job opportunities, and connect with fellow data scientists across Africa and beyond. Private companies, start-ups, governments, and NGOs work with Zindi to source the best machine learning solutions and data science talent in Africa.
e. **AJIRA Digital Program:** The AJIRA program was launched in 2016 with a vision of making Kenya recognized globally as the leading freelancing hub by 2022 with a goal of enabling 1 million youth to earn a decent wage from digital and digitally enabled jobs over three years. The program is anchored on 4 strategic pillars – awareness to build trust and confidence in online work; access to infrastructure; training and mentorship; and access to dignified work through a platform. A 2021 survey undertaken by KEPSA on the program showed that around 1.2 million are digital workers with most of them working on Freelancers, Writer access and Upwork platforms. It is mostly funded by Mastercard Foundation and the Ministry of ICT (particularly the connectivity).

## 3. Funding of ICT talent cultivation

Finding 6: There are several initiatives by government, development partners and private sector actors that focus on funding activities that contribute to ICT talent cultivation.

Taking into consideration the fact that the scope of some of these funding initiatives may be wide, the focus of the review has been on talent cultivation. Under this theme, the following eight funding initiatives have been reviewed:

a. **Tandaa grants** are seed funds from the ICT Authority made available to entrepreneurs who want to provide digital content to relevant Kenyan consumers. The grants provide opportunities for local content developers including film, animation, advertising, publishing, gaming, and education professionals to produce local content. The Tandaa Digital Grant was funded by World Bank with approximately Kshs 7.5 billion (ICT Authority, Kenya, 2020). Tandaa Grants entail US$10,000 for individuals, US$50,000 for new companies, and matching grants of US$150,000 for established companies. It is no longer ongoing.
b. **Pasha Loans** - Pasha Centers are ICT hubs, established to address the ICT disparities between urban and rural populations. These digital villages were the government's effort to ensure digital inclusion to all citizens, especially those from marginalized communities and the university fraternity. These centers were established by entrepreneurs who acquired soft loans from the government out of a revolving fund (ICT Authority, Kenya, 2019); though many are no longer operational.
c. **Netherlands Trust fund for startups** – It was a project that supported increased export competitiveness of ICT sector in Kenya. It enhanced the export competitiveness of micro, small and medium enterprises in the IT&ITES sector in Kenya and linked them to foreign companies interested in offshoring their services to Kenya. This project was funded by the Dutch government, through the Centre for the Promotion of Imports (CBI) affiliated to the Dutch Ministry of Foreign Affairs and was completed.
d. **Universal Service Fund (USF):** The fund is established under the Kenya Communications (Amendment) Act, 2009 and its administered and managed by the Communications Authority of Kenya (CA). The purpose of the fund is to support widespread access to ICT services, promote capacity building and innovation in ICT services in the country. The sources of the fund include levies on licensees, appropriations from government as well as grants and donations. Amongst the achievement of the fund include the computerization of all the 62 libraries in Kenya; and connection to broadband and support to 8 ICT centers for people with disabilities. The fund has also partnered with the Kenya Institute of Curriculum Development (KICD) on digitization of the secondary school curriculum, expansion of voice infrastructure and services, and provision of education broadband connectivity to 885 public secondary schools (Rotich, 2020).
e. **MasterCard Foundation:** The Mastercard Foundation has also been at the forefront in providing funds that support digital talent cultivation in Kenya. Through its Young Africa Works Initiative, the foundation has provided KES30 billion to Kenya to support 30 million youths access dignified jobs in Kenya. The initiative has equipped young people with digital skills ( Mastercard Foundation, 2019). The funding has supported the expansion of the Ajira Digital Program, and funding Moringa School will provide digital and professional skills training in software development and data science through a blended learning model.
f. **The World Bank:** The World Bank and the IFC have supported startups in fintech, and e-commerce. The Bank has also supported the government's efforts in the development of the ICT sector in Kenya. These included establishing digital villages at constituency level to develop information-technology-enabled services (ITES) and BPO centers, facilitating online delivery of services, and improving data collection; and a bandwidth subsidy directed to colleges, universities and BPO centers.
g. **African Development Bank (AfDB):** AfDB is one of the main donor financing ICT innovation and skills development in Kenya. In 2008, the Bank loaned -US$37 million- to Kenya to help finance Technical Industrial Vocational Entrepreneurship Training (TIVET), specifically to develop a national skills training strategy; and establish TVET centers of excellence; enhance skills for computer integration (automation) in industry. In 2012, AfDB also loaned US$47 million to enhance the quality and relevance in higher education, science, and technology, investing in equipment and staff training to provide ICT skills needed in the changing labour market for over 12,000 students.

The following are the main contributions these initiatives are making to talent cultivation in Kenya. First, the Tanda grants and Pasha loans enabled ICT graduates to access funds for enterprise creation thus addressing one of the challenges facing he youth in transitioning to self-employment. Secondly, these two grants, together with the World Banks digital villages, contributed towards reduction disparities in

[24] https://inceptor.co.ke/

[25] https://sci.uonbi.ac.ke/latest-news/umojahack-africa-2021

ICT skills between rural and urban areas in Kenya. Thirdly, the Pasha loans and the Universal Service Fund (USF) have focused some of their activities to enhance inclusivity. The Pasha funds included marginalized community as its target beneficiaries while through the USF, 8 ICT centers for people with disabilities have been established. Finally, the approach of the Netherlands Trust Fund on supporting Kenyan ICT SMEs and linking them with foreign companies interested in offshoring their services to Kenya should be upscaled in Kenya to help transition from training to self-employment.

## 2.3. STRATEGIES AND POLICIES THAT SUPPORT ICT TALENT CULTIVATION

The purpose of the analysis of the existing policies and strategies was to explore the adequacy of these policies and strategies to support talent cultivation efforts by various stakeholders and identify areas of improvements. Table 2.8 shows the analysis framework adopted.

| | **Basic skills, digital literacy and prior learning recognition** | | **Intermediate and advanced ICT skills** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Basic skills and digital literacy | Prior learning recognitions | Demand driven curricula | ICT labour market system | Pedagogy and faculty | Industrial attachment and internship | Incentives to private sector | Academia-industry collaboration | Entrepreneurship | Funding |
| National digital economy strategy (2021) | x | | | | | | | | | |
| Sustainable development policy for the education sector (2017) | x | | x | | | | | | | |
| National ICT policy (2019) | X | | X | | | | X | X | X | |
| National ICT masterplan (2014-2017) | X | | X | | X | X | X | X | X | X |
| Kenya youth development policy (2019) | X | | X | X | | X | X | | X | |
| TVETA strategic plan (2018-2022) | | X | | | | | | | | |
| TVET Policy (2014) | | | X | | | | | | | |
| National Skills Development Policy (2000) | | | | X | | | | | | |
| TVET Policy (2017) | | | | | X | | | | | |
| Sustainable Development Policy (2017) | | | | | X | X | | | | |
| National Skills Development Policy (2020) | | | | | | | | | X | |
| National Digital Economy Strategy (2021) | | | | | | | | | X | X |

Table 2.8: Analysis framework for the policies and strategies reviewed

The main findings are presented below:

### 2.3.1. Basic ICT Skills and Digital Literacy

Finding 1: Most of the ICT and related policies have shown the commitment of the government to talent cultivation at basic ICT skills level and digital literacy. This is a clear demonstration of the interests of the various stakeholders in promoting talent cultivation at this level, which is the foundation for enhancing the digital economy. This interest needs to be converted into more actions and programs.

Most of the policies and strategies by the government have shown a strong commitment towards developing basic ICT skills and digital literacy. These include the National Digital Economy Strategy (2021), Education for Sustainable Development Policy for the Education Sector (2017); National ICT Policy (2019); Kenya National ICT Masterplan (2014-2017) and the Kenya Youth Development Policy (2019). For example:

a. The National Digital Economy Strategy (2021), under its pillar on digital skills and values, aims to develop skills set and values, especially ICT professionals to meet the competencies and expertise required for the digital economy. The pillar aims to increase the number of graduates trained in digital skills, demonstrating required competencies for the digital economy; retrain the workforce to ensure they advance their digital skills and competencies; and bridge the digital talent gaps for workers with digital skills. The pillar will focus on basic skills, intermediate skills, and advanced skills. It is laudable to note that one of the objectives of this pillar is to *"increase Kenya's competitive advantage, both in the private and public sector through successfully building, deploying and maintaining home-grown technologies, platform, systems, applications, etc. to reap the benefits of a truly digital nation"*
b. The Education for Sustainable Development Policy for the Education Sector of 2017 commits the government to provide solar powered computers to every school age child starting with grade 1; and establish computer laboratories and internet services in all public schools to enable access to e-libraries and e- laboratories. The policy also recognizes that majority of teachers are ill equipped to effectively integrate ICT in classroom and that the main challenge for teachers is lack of adequate number of computers, educational applications, training, policy and strategy on how integration should be done.
c. The National ICT Policy (2019) commits the government to integrate ICT subjects in the curriculum at all levels of education and support e-learning.
d. Under MTP II and III of Vision 2030, universal access to ICT is amongst the priority programs of the government.
e. The Kenya National ICT Masterplan (2014-2017) commits the government to promote collaboration with relevant policy makers and regulators to integrate ICT into education and training at all levels and include ICT in schools, colleges and universities curriculum for non-ICT subjects.
f. The Kenya Youth Development Policy (2019) supports the development of a wide range of ICT-based programs in local languages, as appropriate, with content relevant to different groups of youth and promotes investing in education, training and skills development by ensuring that ICT is fully and appropriately integrated into education and training at all levels.

### 2.3.2. Prior Learning Recognition

Finding 2: The National ICT Strategy for Education and Training (2006) has mentioned a Prior Learning Recognition system. This is important to encourage basic ICT Skills development in Kenya.

The National ICT Strategy for Education and Training of 2006 has provided for mainstreaming of Recognition of Prior Learning (RPL) in the Kenyan Education and Training System; attainment of the right recognition of the knowledge and skills required for personal development and the employment market; development and implementation of all competencies gained on the job or as a result of informal or unstructured learning experiences; support expanded engagements in RPL by government agencies, employers and employees' organizations, public and private providers, and RPL practitioners and other stakeholders across all the education and training sectors in Kenya.

### 2.3.3. ICT Skills cultivation in Technical and Vocational Training Institutions

Finding 3: The TVETA Strategic Plan (2018-2022) has provided elaborate interventions to developing intermediate ICT skills at Technical and Vocational Training Institutions in Kenya.

The strategy recognizes the importance of the deployment of intermediate ICT skills to support the digital economy. The policy recognizes the Competency-Based Education and Training (CBET) as catalyst of improvement of TVET education and use of ICT in education and training (e.g. smart classrooms). The policy lauds the introduction of Smart Classrooms at Kenya Technical Trainers College and 9 technical training institutes which has provided Kenya with world-class learning facilities for TVET, and commits the government to upscale it.

### 2.3.4. Demand Driven ICT Curricula

Finding 4: Most of the policies reviewed commit the government to ensure that ICT curricula in tertiary institutions are demand driven. However, these commitments have not been adequately converted into action.

Most of the policies and strategies have shown commitment of the government to developing basic ICT skills and digital literacy. These include the Education for Sustainable Development Policy for the Education Sector (2017); The Technical and Vocational Training policy (2014), National ICT policy (2019), and Kenya National ICT Masterplan (2014-2017). For example:

a. The Education for Sustainable Development Policy for the Education Sector of 2017 has articulated the need to link education with the labour market i.e. to link education with the requirements of industry to ensure youths attain skills that are required in society. On curriculum and pedagogy aspects, the policy commits the government to review of the education curriculum to align it to the changing socio-economic environment so that graduates easily fit into the labour market.

b. The Technical and Vocational Education and Training Policy (2014) calls for a shift from time-bound, standard curriculum-based training to flexible, competency-based education and training (CBET) and shift from supply–led training to demand-driven enrollment. They are to be realized through reforming the pedagogical model and methods of learning while promoting the involvement and participation of industry in both the design, delivery and assessment of TVET skills and competencies.

c. The National ICT policy (2019) recognizes that the application of ICT will transform the human capital development through curriculum development, teaching methodologies, simulation laboratories, life-long learning and distance education.

d. The Kenya National ICT Masterplan (2014-2017) commits the government to collaborate with the Commission of University Education (CUE) and industry to strengthen ICT degree programs in all Kenyan universities; and to work with industry to develop structured ICT training for professionals in all areas.

### 2.3.5. ICT Labour Market Information System

Finding 5: Whereas most policies have recognized the importance of having a demand driven ICT curricula, few of them have mentioned the need to establish a Labour Market Information System for ICT to guide the anticipated ICT skills demand for effective national skills development.

Only the National Skills Development Policy (2020), and the Kenya Youth Development Policy (2019) have mentioned the need to have in place a database of ICT skills available and those anticipated in the future.

### 2.3.6. Training and Internship for ICT Lecturers at tertiary institutions.

Finding 6: Whereas lack of practical training and internship for ICT lecturers in tertiary institutions has been found to be major weakness for developing practically oriented ICT students, none of the policies mention this shortcoming.

There is no mention of the need for training and upskilling lecturers through practical experiences or internships in the policies.

### 2.3.7. Industrial attachment and internship opportunities

Finding 7: There are policy provisions in support of industrial attachments and internships. However, access to industrial attachments and internship opportunities in the ICT industries remain a challenge to many ICT students due to limited spaces.

The National ICT Policy (2019) states that Kenya has insufficient numbers of skilled and experienced experts in ICT and in other professions that rely on ICT. Hence the need to prioritize training and nurturing of local talent as opposed to importing skills. This will require realigning the educational and vocational training pipelines to meet the needs of our labour markets. The Kenya Nation ICT Master Plan (2014-2017) committed the government to partner with industry to finance one-to two-year intensive structured training and attachment programs for up to 500 high-end ICT staff per year in selected areas of ICT. The Kenya Youth Development Policy (2019) emphasized the promotion and development of an entrepreneurial culture among the youth through training, mentorship, internships, attachments, business incubation and partnerships.

### 2.3.8. Incentives for ICT companies to participate in ICT training and apprenticeships.

Finding 8: There are policies to set up incentives for ICT industries to participate in ICT training and apprenticeships to help reduce the mismatch between supply and demand of ICT skills. However, these incentives have not been implemented.

The Education for Sustainable Development Policy for Education Sector (2017) and the National ICT Policy (2019) have stated incentives to enable ICT companies to participate in ICT training and apprenticeship for students from tertiary institutions. For example, the Education and Sustainable Development Policy (2017) commits the government to provide tax incentives to companies offering apprenticeships. According to the National ICT Policy (2019), the government intends to:

a. Encourage the private sector to focus on the identified research and investment priority areas and help create skills in those technologies by funding scholarships, grants, challenges and innovation awards.
b. Incentivize industry with ICT specializations to conduct their own training programs and contribute to institutional training programs, skills domiciliation in projects performed by non-national resources, collaboration between industry and academia and exchange programs.

However, these provisions have not been implemented. Currently, the few ICT industries that participate in training and provision of industrial attachment and internship do so from corporate social responsibility point of view. As a result, there are not adequate opportunities for industrial attachment and internship for the ICT students.

### 2.3.9. Entrepreneurship

Finding 9: There is adequate policy support for entrepreneurship as part of ICT Skills development.

The National Digital Economy Strategy (2021), the National Skills Development Policy (2020); and National ICT Policy (2019) have both vouched for entrepreneurship development in ICT.

The Kenya Digital Economy Strategy, 2021, under its innovation driven pillar, aims to address barriers that limit the growth of digital entrepreneurship, promote innovation and uptake of new technologies, that improves efficiency, and facilitate trade and industry. The key aspect under this pillar is the need to focus on local innovation and commercialization through appropriate support and thus reducing overreliance on imported technologies. Amongst the focus areas of this pillar include (a) fostering entrepreneurial spirit in innovators both within formal education and within the society to turn ideas into scalable and sustainable businesses, and (b) strengthen incubators and accelerators. The aspirations of this pillar are therefore critical and relevant to digital talent cultivation.

The National Skills Development Policy (2020) has emphasized the development of a high-quality skilled workforce/entrepreneur relevant to sectoral requirements of industry and the country's strategic priorities. On the other hand, the National ICT Policy of 2019 focuses on the following two areas relevant to entrepreneurship:

a. Development of a robust technology entrepreneurship ecosystem in the country through an ICT Co-Fund that will unlock requisite capital, avail easy access to critical technical assistance and actively promote the adoption and utilization of local innovations.
b. Promotion of entrepreneurship: the government procurement system will prioritize award of tenders to new and innovative local businesses to permit greater participation by emerging enterprises and preferentially adopt home grown solutions.

### 2.3.10. Youth, Gender and Inclusive Development

Finding 10: There is adequate policy support for ensuring enhanced access to opportunities for ICT skills by the youth, women and marginalized communities

The National Skills Development Policy (NSDP) of 2020 commits the government to enhance inclusivity, equity and access to skills development; and foster entrepreneurship including women entrepreneurship. The National Digital Economy Strategy (2021), under the pillar on inclusiveness, will strive to address challenges that perpetuate digital exclusion in Kenya. Angst these challenges is the skills gaps and mismatches. The pillar, therefore, seeks to transform the marginalized groups into the digitally adaptive, skilled, and innovative workforce that will be able to chart their digital pathways towards inclusive growth and development. The strategy builds on the National Youth Development Policy of 2019 which emphasizes creativity, talent identification and development, investing in skills and entrepreneurship, apprenticeship, and training.

### 2.3.11. Funding mechanisms for youth empowerment projects.

> Finding 11: The National ICT Master Plan provides concrete funding details for youth empowerment projects. However, these have not all been implemented

Apart from the initiatives and programs already mentioned in other sections in this paper which fund activities targeting youth, women and other marginalized groups, the National ICT Master Plan recommended the government's budgetary allocations on ICT as highlighted below:

a. Increase government spending on ICT from 0.3% to 5% of national and county government budgets from 2015/2016, as recommended in the National Broadband Strategy.
b. Use of Universal Access Fund (which collects 0.5% of turnover of ICT operators and service providers) from 2015/2016 to fund broadband roll-out in under-served areas, as recommended in the National Broadband Strategy.
c. Use of the Equalization Fund to support ICT projects in marginalized counties from 2014/2015.
d. Use the National Research Fund (2% GDP) or other Government Supported Venture Capital Fund to finance and commercialize ICT innovations.
e. Provision of risk guarantees for micro and small businesses through a statutory prescribed agency to consolidate all Ministries' ICT budgets by 2015/2016 for ICT projects only.

This funding has the potential to contribute to youth and women empowerment as well as those from marginalized areas of the country.

## 2.4. INFRASTRUCTURE ACCESS FOR DIGITAL TALENT

Sustainable ICT talent cultivation is heavily dependent on strong internet connectivity, access to power, and access to devices along with the existing strong institutional support systems[26].

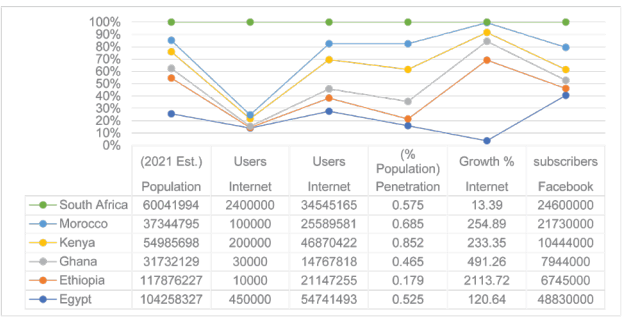
### 2.4.1. Access to Broadband

***Status of national broadband access***

Kenya Vision 2030, and various policies by the government of Kenya have led to a significant contribution to the growth of infrastructure, programs, resource access, and developing ICT skills. Through the MTP III, great strides have been made in the development of infrastructure. The **National Optic Fibre Backbone Infrastructure (NOFBI) project** enabled the installation of 9,000 kilometres of Fibre across all the 47 counties and majority of sub-counties. This has provided a robust infrastructure to citizens, eased communication across counties as well as improved government service delivery to the citizens such as the application of national identity cards, passports, and registration of birth and death certificates. Network operators are able to leverage on it to build last mile to homes or businesses, whilst NOFBI aims to connect more schools in the future. Other private sector network operators are also active providing fiber to education institutions, homes and businesses.

***Internet penetration***

The efforts elaborated by different players in upscaling internet access could be argued to have brought in good results as projected by the various internet penetration statistics. The data of the population vs internet users gathered by the Internet World Stats in Figure 2.11 show that Kenya has made tremendous growth in population that has internet penetration and in internet access as compared to South Africa, though penetration of higher-speed broadband is lower than that of internet.




| | (2021 Est.) Population | Users Internet | Users Internet | (% Population) Penetration | Growth % Internet | subscribers Facebook |
|---|---|---|---|---|---|---|
| South Africa | 60041994 | 2400000 | 34545165 | 0.575 | 13.39 | 24600000 |
| Morocco | 37344795 | 100000 | 25589581 | 0.685 | 254.89 | 21730000 |
| Kenya | 54985698 | 200000 | 46870422 | 0.852 | 233.35 | 10444000 |
| Ghana | 31732129 | 30000 | 14767818 | 0.465 | 491.26 | 7944000 |
| Ethiopia | 117876227 | 10000 | 21147255 | 0.179 | 2113.72 | 6745000 |
| Egypt | 104258327 | 450000 | 54741493 | 0.525 | 120.64 | 48830000 |

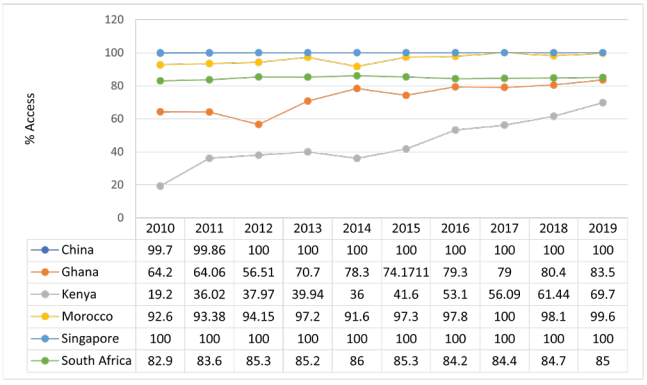
Figure 2.11: Africa 2021 population and internet users' statistics
Source: African Centre for Technology Studies based on (The Internet World Stats, 2021).

***Broadband connectivity in Kenyan learning institutions***

The Digital Literacy Program (DLP) initiative has also contributed towards improvement of ICT infrastructure (electricity and devices) but has not yet provided connectivity to primary schools, though almost 900 secondary schools have been connected by the Universal Service Fund (Communications Authority of Kenya, 2018) and in 2021 the Giga initiative began connecting 100 primary schools to the internet, and the ICT Authority connected 13 to NOFBI whilst developing a plan to connect many more. Kenya Education Network Trust (KENET) rides on NOFBI and other infrastructure to connect 140+ member institutions to high-speed global Internet which covers all Universities.

## 2.4.2. Access to electricity

In terms of access to electricity for homes (Figure 2.12) which is an important component for digital talent cultivation, Kenya was at 70 % in 2019, behind China, Ghana, Morocco, Singapore, South Africa. The rural access is at 62 % while urban access is at 91 %. Morocco, Singapore and China are amongst the benchmark countries with almost 100% rural access to electricity.




| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|
| China | 99.7 | 99.86 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Ghana | 64.2 | 64.06 | 56.51 | 70.7 | 78.3 | 74.1711 | 79.3 | 79 | 80.4 | 83.5 |
| Kenya | 19.2 | 36.02 | 37.97 | 39.94 | 36 | 41.6 | 53.1 | 56.09 | 61.44 | 69.7 |
| Morocco | 92.6 | 93.38 | 94.15 | 97.2 | 91.6 | 97.3 | 97.8 | 100 | 98.1 | 99.6 |
| Singapore | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| South Africa | 82.9 | 83.6 | 85.3 | 85.2 | 86 | 85.3 | 84.2 | 84.4 | 84.7 | 85 |

Figure 2.12.: Access to electricity (% of the population) - China, Ghana, Kenya, Morocco, Singapore, South Africa
Source: African Centre for Technology Studies based on (The World Bank, 2021).

## 2.4.3. Access to devices

***Device ownership (Computers)***

Smartphones (which are quite widely available, covering around 50% of the population which is an even higher proportion of all youth + adults if excluding children) or tablets are only suitable for basic ICT usage, so computers or laptops are necessary for more advanced use. A report by Afro barometer found that only 19 % of the Kenyan households have computers (Isbell, 2020). The National ICT Survey 2010 which is corroborated by (Isbell, 2020) of computer ownership across the socio-demographic group in 2019 in Kenya showed that computer access by individuals with higher education is very much higher than those in the primary and pre-primary with those in the primary slightly below those in the pre-primary. In terms of ownership by gender, the female gender appears to be still lagging both in terms of computer and internet access as compared to the male counterparts. Nairobi exhibits the highest access rates to computer as compared to other provinces as it was then known with urban areas having also higher access to computer and internet (Figure 2.13).

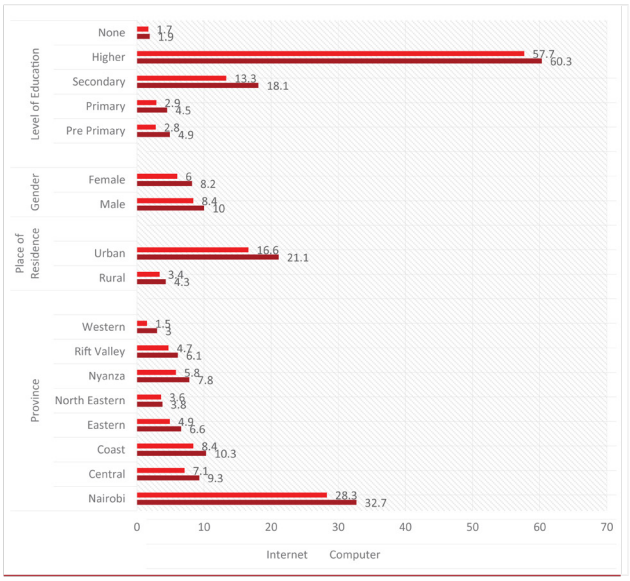



Figure 2.13: Percentage Distribution of Population with Access to Computer Equipment
Source (African Centre for Technology Study based on (Kenya National Bureau of Statistics, 2020)

[26] https://www.internetsociety.org/resources/doc/2017/flow-of-information-of-the-follow-up-of-the-world-summit-on-the-information-society-wsis/

[27] SACLA2015ICTGraduateViewonICTSkillsrequirements.pdf

[28] https://en.ichei.org/Uploads/Download/2021-06-23/60d2e8159c9c8.pdf

***Access to shared devices***

Since its inception in the year 2002, the Computers for Schools Kenya (CFSK) has managed to distribute more than 360,000 computers to more than 10,000 schools (Business Daily, 2017). Another notable access point for communal like computer access can be seen in the Ajira Youth Empowerment Centres (AYECs) initiative. The AYECs have provided platforms and support for the access to computers and internet to the youths through various centres from different counties all over Kenya (Figure 2.14). There are also thousands of for-profit cyber cafes across the country. These are important opportunities for access to computers, particularly for those who cannot afford their own.

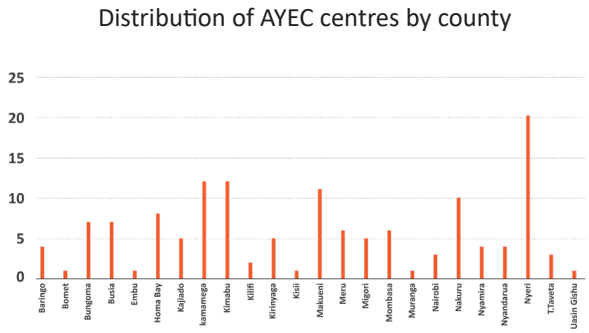



Figure 2.14: Number of AYEC centres by county

https://ajiradigital.go.ke/#/centres

# SECTION THREE

## BENCHMARKING, GAP ANALYSIS AND DESIRED TALENT CULTIVATION APPROACH

### 3.1. BENCHMARKING AND BEST PRACTICE

The purpose of the benchmarking was to document best practices outside Kenya where specific initiatives have been developed and implemented. The identified best practices have been used to solidify the proposed ICT Talent cultivation approach. For benchmarking, the following seven countries that have performed very well in digital readiness ranking and other aspects of digital economy were selected.

**Benchmarking countries**

a. Three from lower middle-income countries (South Africa, India, Morocco, Tunisia)
b. Two from Upper middle-income countries (China, Mauritius)
c. Two from high-income countries (South Korea, UK, and Singapore)

The benchmarking focused on the following six aspects of the proposed ICT talent cultivation approach –curricula; incentives to enable private sector to participate in ICT talent cultivation; University-Industry Collaboration; industrial attachment, internship and job placement; incentives to private sector to invest in ICT projects; and e-Learning.

#### 3.1.1. Demand driven curricula

1. **South Africa:** In South Africa, most Universities have established advisory boards to check on current industry trends and align them with the training in universities. They also carry out regular surveys through alumni associations to get currents industry trends[27]. In addition, the Institute of Information Technology Professionals South Africa (IITPSA) in collaboration with the Joburg Centre for Software Engineering (JCSE) at the University of the Witwatersrand and the Media Information and Communications Technology Sector Education Training Authority (MICT SETA), conducts an annual ICT Skills Survey and produces a report to inform the SETA, employers and other stakeholders on skills development needs for their Sectors.
2. **Morocco:** In 2019, King Mohammed VI announced the creation of "Cities of Trades and Skills". The objective of these projects is to provide quality training which guarantees convergence between the training provided and the real needs of the labour market and contributes to the promotion of the image of vocational training as a lever for development, employment and social inclusion[28]. In addition, the national Digital Talent Review has developed a unique framework - The Digital Skills Matrix- to have a full spectrum analysis of digital skills sets. The Matrix compares the gaps between the industry needs, embodied by the workforce and human resources leaders and the academia. In this regard, 80 programs were identified with 500 digital related courses which were reviewed and aligned with the industry's digital skill needs coming from the study[29].

#### 3.1.2. Incentives for private sector participation in ICT talent cultivation

1. **South Korea:** Under the US$ 50 billion Korean Digital New Deal, which is an ambitious plan to enable digital technology players in the private sector to create an enabling eco-system for innovation, the government plans to upscale digital infrastructure and create 903,000 jobs. Part of the deal will be to provide incentives such as lowered taxes, and procurement quotas for businesses to hire young employees in IT-related fields and for providing short-term internship programs for young employees. Job matching support will also be provided to connect young graduates from science and engineering backgrounds to SMEs[30].
2. **Singapore:** The government of Singapore has an incentive structure which includes providing subsidy or grants to businesses for training local talent to operate new technologies[31].
3. **United Kingdom:** Tax incentive for firms that support the innovative landscape - R&D tax credits are an important part of the UK government's support for

[29] https://en.ichei.org/Uploads/Download/2021-06-23/60d2e8159c9c8.pdf

[30] https://www1.undp.org/content/seoul_policy_center/en/home/presscenter/articles/2019/Collection_of_Examples_from_the_Republic_of_Korea/korean-new-deal-for-the-post-covid-19-era.html

innovative business, incentivizing businesses to invest in R&D by allowing companies to claim an enhanced corporation tax deduction or payable credit on their R&D costs. R&D in the private sector is often done together with universities, thereby exposing trainees to talent cultivation activities[32].

### 3.1.3. University-Industry Collaboration

1. **South Africa:** The government has developed the National Digital and Future Skills strategy[33]. Specifically, Strategy element 3 focuses on Skills for Industry and the world of work, which outlines measures to strengthen the CoLabs, tech hubs and all related institutions. The government also offers tax incentives as a policy. Universities and industries, that do more publications in emerging technologies get government funding, with some of the funding trickling down to the researchers who mostly involve their students in the research.

2. **China:** There are three ways through which universities in China collaborate with industrial organizations in typical technology and industrial fields: technology transfer between universities and industries; collaborative R&D between universities and industries in practical fields; and finally university-run high-tech companies. The universities in China have a 'downstream' tendency which in turn has led to several established university-run enterprises. Beyond the triple-helix model, these firms provide a more direct industrialization of knowledge generated by universities[34]. The Chinese government released a work plan in October 2019 to have medium to large sized private enterprises run apprenticeship type programs by 2022[35].

3. **Tunisia:** To create an incentive for the investors in digital technologies, the government has launched a EUR 50 million new investment program, which will create 400,000 new high-skill jobs. The program also calls for a stronger collaboration between public and private actors. According to the new TVET policy, each TVET center should have a public-private advisory committee chaired by private sector representatives[36].

4. **Morocco:** Morocco has launched three new projects, including a $US 65 million research fund, to encourage partnerships between researchers and businesses and boost investments on cutting edge innovations. Given that most researchers are from the universities, this measure incentivizes talent cultivation among college youth. The project includes building four new 'innovation cities'—science and technology hubs that will host research centers, specialized companies and business incubators. These are the Moroccan Center for Innovation (MCI), and three research funds worth $US 65 million[37].

5. **Mauritius:** In Mauritius, the government has inaugurated an industry-driven ICT Academy, based on a public-private partnership (PPP) model to help Mauritius keep pace with the latest developments on digital economy[38]. The academy has established Accenture Open Education in collaboration with Accenture Services (Mauritius) Ltd and the Open University of Mauritius (UoM). Accenture Services (Mauritius) Ltd is the local branch of the multinational information technology (IT) and outsourcing (BPO) and Accenture[39]. In addition, Polytechnics Mauritius Ltd (PML) was set up as a state-owned enterprise registered as a private company but with 100% government shareholding and offers academic programmes on a franchise basis from relevant institutions in Australia, Canada, Malaysia, Switzerland, Singapore and also Mauritius[40]. The government also plans to identify "Technology Champions". These are startups coming out of research-based incubators which are on the brink of becoming big and which require all the support they can get. Part of the plan is to attract innovative businesses to locate near university campuses. Procurement rules would also suit players that focus on methods of ICT deployment that support the digital transformation of the public sector; and protection of intellectual property rights (IPRs) is an integral part of an enabling legal and regulatory framework[41].

6. **Singapore:** Singapore has several initiatives that support university-industry collaboration. For example, the industry Alignment Fund has been set up to encourage public researchers to work more closely with industry. The Corp Lab@University scheme, launched

[31] https://home.kpmg/sg/en/home/media/press-releases/2018/01/singapore-businesses-want-more-support-to-grow-in-the-digital-economy.html

[32] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009577/uk-innovation-strategy.pdf].

[33] https://www.gov.za/sites/default/files/gcis_document/202009/43730gen513.pdf

[34] https://www.phdcci.in/wp-content/uploads/2019/10/Framework-of-University-Industry-Linkages-in-Research-DSIR-16-Oct_-Forweb.pdf

[35] https://internationaleducation.gov.au/international-network/china/PolicyUpdates-China-.aspx

in March 2013 by the National Research Foundation (NRF), supports the establishment of key laboratories by industries in universities. It seeks to enhance collaborative partnerships between universities and industries, and enable faculty, researchers, PhD and Master's students to work alongside companies on programmes that have direct relevance for the industry[42]. Universities Technology Transfer Office Fund (AU TTO Fund) tasks universities to facilitate strategic engagement with industry and foster close interaction with faculties and research centers.

7. **United Kingdom:** The UK has the largest share (more than 25%) of businesses collaborating with universities. For example, the National Centre for Universities and Business (NCUB) is an independent and not-for-profit membership organization that was created to promote, develop and support university-business collaboration across the UK. University Enterprise Zones (UEZs) are specific geographical areas where universities and business work together to increase local growth and innovation' through a partnership of LEPs, universities and others, alongside a package of business support from government[43]. The Research Councils and Innovate UK are major sources of funding for business university collaboration in the UK.

### 3.1.4. Industrial Attachment and Internships

In all the countries reviewed, there is strong emphasize on industrial attachment and internships as key to training in tertiary institutions. Below are some of the unique approaches that were identified from the review.

1. **India:** The All-India Council for Technical Education (AICTE) has an internship policy, guidelines and procedures for students in India. All the AICTE approved institutes are required to have a dedicated Training and Placement Cell headed by a Training and Placement Officer (TPO) who guides students to choose the right career and helps plan programs and activities to enhance knowledge, skill, attitude and the right kind of aptitude to meet the manpower requirements of the industry. In order to facilitate internships for the students, AICTE has been identifying organizations/ Ministries both in India & abroad and signing MoUs[44].

2. **Morocco:** Internships are compulsory during the last year of the training programme for learners who are working towards obtaining a vocational certificate. The internship, which usually lasts for three to six months, takes place within a company or government department as part of an internship agreement signed between the training institution and the host business. The intern is required to perform a practical role within the company, which is supervised by an internship mentor and their appointed supervisor within the training institute. At the end of the internship, the learner submits an internship report, which is one of the requirements for receiving a diploma[45].

3. **Tunisia:** ANETI (Agence nationale pour l'emploi et le travail indépendant), created under Law 93-11 of 17 February 1993, a public non-administrative body attached to the Ministry of Vocational Training and Employment, is the agency responsible for internship. During the contract period, ANETI supports training costs and pays a monthly allowance to the trainee. If a company employs the trainee, it will receive a subsidy. To be eligible for the above-mentioned benefits package, the trainee should be registered with ANETI[46].

4. **China:** Apart from the usual internship programs, since July 2014, the Chinese Scholarship Council signed a cooperation agreement on the establishment of internship programs with UNESCO, UNJCR, UNDP and IFAD. The scholarship covers international travel fees and basic living costs. Furthermore, there is no obligation for recipients of the internship to return to China to work after completion of the internship. In 2020, the Council aimed to send 750 students to international organizations for internship positions. In 2020, 16 interns were working at UNHCR, 12 at the UNDP, and 20 at IFAD after applying through the Council. Many interns have even been offered permanent positions in the respective organizations after the internships. In 2014, there were 893 Chinese nationals working for the United Nations. In 2019, this number had grown to

[36] https://documents[1].worldbank.org/curated/en/[465581593566209488]/pdf/

[37] https://www.integrallc.com/morocco-launches-project-to-fund-innovations/

[38] https://ionnews.mu/mauritius-launches-industry-driven-ict-academy-public-private-partnership/

[39] The Accenture Open Education is a training program established by the ICT Academy in collaboration with Accenture Sevices (Mauritius) Ltd and the Open University of Mauritius (UoM). https://business.mega.mu/[2012]/[11]/[08]/ict-academy-free-course-software-developer/.

[40] https://www.universityworldnews.com/post.php?story=[20210707095325999]

[41] https://ncb.govmu.org/ncb/strategicplans/DigitalMauritius[2030].pdf.

[42] https://www.researchgate.net/publication/[265736868]_Linkage_and_Collaboration_between_Universities_and_Industries_in_Singapore

1,336 employees [47]

5. **South Korea:** The government has also acknowledged the role of internships and enacted several polices aimed at mitigating some of the aforementioned issues with internships, for instance small and medium-sized enterprises can receive government subsidies for the wage costs associated with internships and grants to encourage conversion to regular employment (Kuczera et al., 2009).

6. **Singapore:** Institutes of Higher Learning (IHLs) place strong focus on industrial attachments and internships for their students, to complement their learning in the classroom. This is the case across all sectors and courses, including in the specialized fields of green technology, urban farming and Artificial Intelligence (AI). In total, there were 25,000 internship opportunities in Academic Year 2019/2020 for students in courses related to ICT, AI, environmental studies and environmental engineering, urban greenery, clean energy and green building management etc.

7. **United Kingdom:** UK has implemented the concept of knowledge transfer partnership, in which, through a grant, a recent graduate would be supported to work in an industry to support the implementation of a project, which is desired by the industry, but which depends on a technology developed by the university. The project therefore facilitates technology transfer from university to industry through the graduate students. The interns spend 80% of his/her time in the industry and 20% in the university to facilitate the knowledge transfer. 60% of such graduates eventually get employed in the industry. During 2008-2013, the British Council piloted this approach, through the African Knowledge Transfer Partnership in Kenya, Uganda, South Africa, Nigeria and Ghana.

### 3.1.5. Incentives for private sector participation in investing in ICT projects

1. **India:** The government incentivizes digital development players (who naturally cultivate talent through their promotion of a digital development ecosystem) to improve infrastructure in support of Digital India, an ambitious initiative to double the size of the country's digital economy[49]. Players in digital research and development are also incentivized by the government encouraging innovation and investment in intellectual property within India. Indian digital innovators are also supported through strategic procurement. The government is a large potential buyer of services and can act as a market maker to create scale for the best innovations and technology applications coming out of the country[50].

2. **China:** Chinese government has emulated, from USA and Europe, manufacturing extension activities that emphasizes supporting small and medium enterprises (SMEs) to absorb existing and emerging technologies. There is matching government grants to facilitate the digitization of SMEs, sometimes by partnering SMEs with large ICT companies. At the "Dream Town" two kilometers from Hangzhou, ICT start-up businesses are provided with free office space and infrastructure for at least three years. The initiative was launched in 2015, with more than 7,000 companies working on more than 700 projects here in the first two years[51]

3. **Singapore:** The government of Singapore has several incentives for ICT industries. These include (a) providing additional tax support similar to the PIC scheme to defray the costs in implementing new cutting edge technology and innovation development; (b) subsidizing or providing grants to businesses for training local talent to operate new technologies; (c) Automation Support Package (ASP) to encourage companies to implement large-scale automation projects as part of Singapore's drive towards building a Smart Nation; and (d) continued tightening of foreign workforce policies - striking a balance between growing local employment and bringing in foreign expertise where necessary[52].

[43] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/440927/bis_15_352_The_dowling_review_of_business-university_rearch_collaborations_2.pdf

[44] https://aicte-internship-policy-aicte-india-org.pdf

[45] https://unevoc.unesco.org/pub/work-based_learning_morocco_en.pdf

[46] *etf_employment_policies_tunisia.pdf

### 3.1.6. e-Learning

1. **Mauritius** The e-Learning initiative at the university was launched in 2001 with the setting up of the Virtual Centre for Innovative Learning Technologies. Fifteen years later, the initiative has attained a level of maturity where 4 programmes of studies are offered on a mainly online mode of delivery (Issack, Wah, & Bahadur, 2016).

2. **South Korea:** Since 1996 the development of ICTs within the education system has been implemented under three national master plans. The first Master Plan (1996—2000) was focused on the establishment of a world-class ICT infrastructure in elementary and secondary schools. The objective of the second Master Plan (2001— 2005) was to enhance the quality of education by allowing open access to educational content and providing teacher training for the integration of ICT into classroom teaching practices. In addition, the National Education Information System (NEIS) was developed as a computer network maintained by the Ministry of Education to facilitate the electronic management of all education-related administrative tasks. The third and most recent Master Plan (2006— 2010) has been focused on the creation of sustainable learning environments with e-Learning and future education through more flexible and secure educational services such as the development of digital textbooks (Hwang, Yang, & Kim, 2010).

## 3.2. GAP ANALYSIS

### 3.2.1. Demand for ICT skills

**1. Kenyan's progress towards the digital economy is still in its early days**

Although Kenya has made progress, and is rated amongst the top 3 or 5 in Sub-Saharan African countries by most indexes, globally, Kenyan readiness for digital economy is still considered weak. It is ranked position 70 out of 79 countries by Huawei Global Connectivity Index (2020), 84 out of 134 countries by Network Readiness Index (2020) and 105 out 158 countries by UNCTAD's 2021 readiness for frontier technology index. For comparison, the UNCTAD's 2021 readiness index ranks Singapore in position 5, Korea in position 7, China in position 25, India in position 43, South Africa in position 54, Tunisia in position 60 and Morocco in position 77. In all the three assessments, the component on digital skills was amongst pillars in which Kenya underperformed.

**2. Significant ICT skills gaps exist now and are expected in the future**

The most-rare skills that are in demand, and which can be associated with the gaps in Kenya are big data/analytics, cybersecurity and Artificial Intelligence (Santora, 2019). This means that data security, data analysis and processing, and value addition through the incorporation of AI/ML would be a natural skill demanded by most of the economic sectors. According to World Economic Forum Future of Work report (2020) cloud computing, big data, IoT and connected devices remain high priorities amongst the technologies that companies are likely to adopt by 2025. These new technologies will drive future growth across industries as well as increase the demand of new job roles and skills. The skills gaps in the labour market and the inability to attract the right talent remains among the leading barriers to the adoption of new technologies (WEF 2020).

**3. High current and future demand for ICT skills**

A labour market analysis from IFC and the World Bank showed that by 2030, 50-55% of jobs in Kenya will depend on digital skills, up from 25-30% in 2019[53]. Agriculture will account for 35-40 %, industry 45-50 % and services 60-65%. Cumulatively some 32 million ICT skills training opportunities will have been created by then, 21 million will be basic ICT skills (foundational), 1.9 million intermediate skills and 1.3 million advanced skills. In addition, another 8 million training opportunities will be from occupation outside ICT specialties and will be generated by enterprises adopting digital technologies, e.g. accountants using accounting software packages.

**4. Need for National ICT skills database to guide demand**

Kenya currently does not have a standalone national ICT skills database that regularly documents the current ICT skills gaps in the industry and future ICT skills requirements. There is the Kenya Labour Market Information System (KLMIS), which was established in 2017 and serves as a Labour Market observatory/ intelligence/ watchtower for the economy through the provision of timely, relevant, and reliable labour market information[54]. KLMIS has been providing regular information on the labour market in Kenya including labour demand trends, labour supply, labour market services and training services. KLMIS has also been conducting surveys on relevant labour market issues

[47] https://www.csc.edu.cn/article/1765
https://unsceb.org/content/un-system-human-resources-statistics

[49] https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/digital-india-technology-to-transform-a-connected-nation

[50] https://www.meity.gov.in/writereaddata/files/india_trillion-dollar_digital_opportunity.pdf

key of which include the informal sector in Kenya. However, inadequate funding limits KLMIS capacity to undertake regular research, data collection and sectoral surveys[55].

To keep up with the rapidly changing ICT technologies, some benchmark countries have put in place programs to undertake annual ICT skills surveys to inform ICT skills development plan. For example, Morocco has in place the Digital Skills Matrix, while South Africa has University Advisory Boards that checks the current ICT industry trends and align them with the training in universities.

### 3.2.2. Supply of ICT skills

**1. Need to update strategy on ICT Talent Cultivation to build on the policies**

The existing policies and strategies are adequate to address the current challenges of ICT training and education. They are also adequate to cover all aspects of the proposed ICT Talent Cultivation Approach. However, the provisions related to talent cultivation are scattered in different policies and strategies and are being implemented by different agencies, making coordination difficulty. The only standalone strategy, National ICT Strategy for Education and Training (2006) is old, and stakeholders would like it reviewed. There is need to consolidate all the enabling provisions on ICT talent cultivation in one reference document, which could be done as operationalization document of the Digital Economy Strategy's Skills and Values pillar.

**2. Initial progress at enhancing ICT readiness at basic education Level**

The level of ICT readiness at the basic education level has made progress thanks to DLP with almost all primary schools having power, devices and digital curriculum having been created, but few of the schools are connected to the internet, and teacher capacity is still low despite some initial training. Meanwhile secondary schools are still lacking digital curriculum by government (though there is some by private sector), devices, internet and suitably trained teachers. In addition, a report by Afro barometer found that only 19% of the Kenyan households have computers (Isbell, 2020).

**3.Growing - but still low number of ICT graduates at intermediate and advanced ICT skills level**

The current number of ICT graduates produced by the Kenyan tertiary institutions is considered insufficient to meet the market demand. In 2018, the 31 Public Chartered Universities reported that ICT courses accounted for only 176 programs (4.3%) out of a total of 4972 programs in these universities at Diploma, BSc, MSc and PhD levels. During the academic year 2020/21, about 547,700 students were enrolled in Kenya, 81% being in public universities and around 100,000 students graduate per year (Julia Faria, 2021). This translates to about 5,000 ICT students graduating per year. This estimation is closer to the projection of 5,874 provided by Mercy Corps (2019). This compares poorly with the market requirements of around 3.2 million ICT training opportunities in Kenya at diploma level and above projected cumulatively by 2030[56].

**4. Need to support girls and women to get into ICT careers**

Women only make up around a third of current ICT students due to many barriers; not studying ICT means women missing out the good quality job opportunities available to them in the industry which are growing fast, and the country misses out on a large pool of talent.

**5. Progress with online content but low level of e-Learning in Kenya**

In Kenya, the adoption of online learning as a method of teaching has been slow, in both basic education, TVET institutions and universities. KICD and some private providers have made progress during COVID-19 but the implementation of e-Learning is still faced with multiple challenges. These include intermittent internet connectivity for staff and students in some regions; high cost of internet connectivity; limits to the number of participants per session while facilitating synchronous sessions using free versions of online meeting platforms; limited access to computers while at home, frequent electricity blackouts, low ICT literacy skills and, high-cost licenses for operating systems (Njoka, Githui, & Ndegwa, 2020). Yet, because of covid-19 pandemic, projections by the 2020 World Economic Forum Report on future of jobs, indicates that the demand for online learning and training will rise several folds. There has been a 400% increase in the numbers of individuals seeking out opportunities for learning online and a 500 % increase on employers' provision of online learning opportunities to their learners and a corresponding 900% enrolment increase for learners accessing online learning through government programs (WEF 2020).

[51] https://akjournals.com/view/journals/032/70/S/article-p95.xml

[52] https://home.kpmg/sg/en/home/media/press-releases/2018/01/singapore-businesses-want-more-support-to-grow-in-the-digital-economy.html

[53] https://www.weforum.org/agenda/2020/10/africa-needs-digital-skills-across-the-economy-not-just-tech-sector/

[54] https://www.labourmarket.go.ke/

[55] https://wapes.org/fr/system/files/nairobi_2017_muraya_en.pdf

**6. Limited progress so far ensuring ICT curricula are market driven**

Despite some of the ICT Academies helping bring some up-to-date curricula for certain short courses to some lecturers/ students from private sector partners, on the whole there is disconnect between academia and the private sector, with universities offering curricula and teaching practices that are not aligned with the needs of the job market. Universities are developing a workforce that is neither guided by a human resource development policy, nor well aligned to the industry needs, especially at the higher end of the spectrum (MICT 2017). With a rapidly growing ICT sector, most universities are slow to catch up with evolving demand for IT skills and emerging technologies, which forces graduates from these universities to teach themselves. Furthermore, most ICT faculty do not have industry experience and only a few have PhD degrees (Mercy Corps 2019). Whereas most of the policies and strategies such as Sustainable Development Policy for the Education Sector (2017); The Technical and Vocational Training policy (2014), National ICT policy (2019), and Kenya National ICT Masterplan (2014-2017), have shown commitment of the government to support the development of ICT curricula that are aligned to the market, not much has been realized. Lack of regularly updated ICT skills data base and weak academia-university linkages has made the realization of demand driven curricula difficult.

**7. Need for more funding and opportunities for industrial attachment and internships**

Most institutions acknowledge that the industrial attachment (IA) and internship experience is important to: facilitate the trainee to develop awareness on the requirements of the world of work, enhance already acquired work related skills which include social skills, have a hands-on experience with modern technology in whichever workplace a trainee serves, as well as, make a personal connection between theory and practice (Mihail, 2006; Kiplagat, Khamais and Karei 2016). However, there are challenges on securing industrial attachment opportunities. First, majority of students have to find their own industrial attachments and only 5% of the students received placement through their respective departments (Langat, Omboto, Ambuli and Ngeno, 2021). Secondly, there is scarcity of industrial attachment opportunities offered by the private sector (Aineah, 2019) despite the efforts of the PDTP which only provides for about 400 students per year and some other programs such as Huawei's Seeds for the Future.
Benchmarking countries such as India, Morocco, Tunisia, and China have put in place measures to strengthen industrial attachment, as a key component of training. In India, as a policy, all TVETs and universities are required to have a dedicated training and placement cell headed by Training and Placement Officer (TPO) to address all aspects of industrial attachment and internship, while Tunisia has a national agency responsible for industrial attachment and internship. China has introduced a framework for supporting their graduates to undertake sponsored internships in UN bodies.

**8. Weak Academia-Industry collaboration overall despite some successes**

Tertiary institutions in Kenya collaborate with industry in various ways including curriculum development, student placement, staff engagement and consultancies, innovation and community-based initiatives[57]. Several institutions have set up incubators, accelerators, and hubs with varying success. The Chandaria Business Innovation and Incubation Centre of Kenyatta University hosts entrepreneurship programmes that have strong links with industry. Jomo Kenyatta University of Agriculture and Technology is engaged with the Nairobi Industrial and Technology Park, providing infrastructure that supports growth companies[58]. Maastricht School of Management (MSM) are part of the Kenya Industry and Entrepreneurship Project (KIEP) in collaboration with Linking Industry with Academia (LIWA) and The Kenya Private Sector Alliance (KEPSA) to increase productivity and innovation in selected private sector firms[59]. There is also the Kenya Education for Employment Program (KEFEP) is an initiative focused on strengthening and supporting technical and vocational education and training (TVET) in Kenya in partnership with the Kenyan Ministry of Education (MOE) and in collaboration with key industry representatives[60]. Despite the above-mentioned initiatives and the ICT Academies from Huawei and other companies that are narrowly focused on training, the level of university-industry collaboration is rated low due to several barriers. These the absence of policies for incentivizing partnership efforts in the universities, and lack of institutional and national support structures to coordinate establishment of such partnerships[61].

All the benchmarking countries have useful best practices to learn from. For example China encourages universities to establish university-run enterprises, supports collaborative

[56] https://www.weforum.org/agenda/2020/10/africa-needs-digital-skills-across-the-economy-not-just-tech-sector/

[57] https://ir. library.ku.ac.ke/bitstream/handle/123456789/18872/Strengthening%20University%20Partnerships

[58] https://www.tandfonline.com/doi/full/10.1080/20421338.2020.1796012

[59] https://www.msm.nl/news-events-and-blogs/news/the-kenya-industry-and-entrepreneurship-project?

[56] https://www.collegesinstitutes.ca/what-we-do/international/education-for-employment/kenya/

[61] http://ir-library.mmarau.ac.ke:8080/xmlui/bitstream/handle/123456789/3197/

R&D between universities and industries and allow large sized private enterprises to run apprenticeship programs. Tunisia requires that each TVET Centre should have a public-private advisory committee chaired by private sector representative. Mauritius has a program to attract business to locate near university campuses whereas Singapore, through their CorpLab@ university scheme, support the establishment of key laboratories by industries in universities.

**9. Incentives for private sector participation have not been implemented**

The Education for Sustainable Development Policy for Education Sector (2017) and the National ICT Policy (2019) have provided for incentives to enable ICT companies to participate in ICT training and apprenticeship for students from tertiary institutions. For example, the Education and Sustainable Development Policy (2017) commits the government to provide tax incentives to companies offering apprenticeships. Similarly, the National ICT Policy (2019), commits the government to incentivize industry with ICT specialization to conduct their own training program and contribute to institutional training programs. However, these provisions have not been implemented. Currently, the few ICT industries that participate in training and provision of industrial attachment and internship do so from corporate social responsibility point of view. As a result, there are not adequate opportunities for industrial attachment and internship for the ICT students.

Some benchmarking countries such as Singapore and South Korea, have in place incentive programs. For example, under the US$ 50 billion Korean Digital New Deal, which is an ambitious plan to enable digital technology players in the private sector to create an enabling eco-system for innovation, the government intend to provide incentives such as lowered taxes, and procurement quotas for businesses to hire young employees in IT-related fields and for providing short-term internship programs for young employees[62]. On the other hand, the government of Singapore has an incentive structure which include providing subsidy or grants to businesses for training local talent to operate new technologies[63].

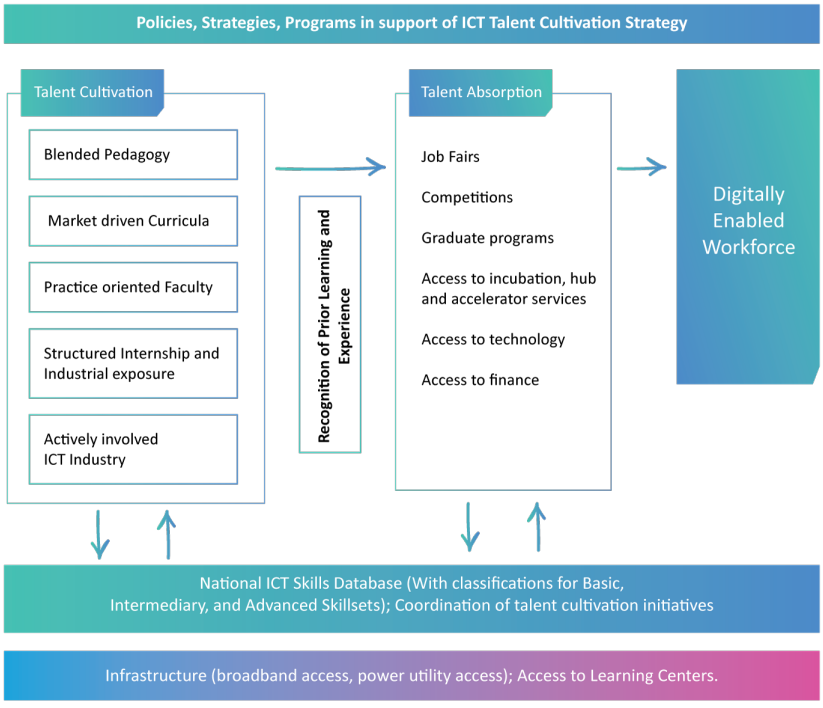



Figure 3.1: Desired Future ICT Talent Cultivation Approach

[62] https://www1.undp.org/content/seoul_policy_center/en/home/presscenter/articles/2019/Collection_of_Examples_from_the_Republic_of_Korea/korean-new-deal-for-the-post-covid-19-era.html

[63] https://home.kpmg/sg/en/home/media/press-releases/2018/01/singapore-businesses-want-more-support-to-grow-in-the-digital-economy.html

### 3.2.3. Desired Future ICT Talent Cultivation Approach

Based on the Situation analysis, benchmarking, and gap analysis, Figure 3.1 presents a picture of how an effective ICT talent cultivation could look like.

The desired future talent cultivation approach will be defined by the following:

a. **Policies, strategies and programmes:** Updated, integrated, and aligned set of policies, strategies and programmes that are implemented.

b. **Infrastructure:** Enhancement of relevant infrastructure in educational institutions and individuals' homes.

c. **Blended and ICT supported pedagogy:** A move from the traditional face-to-face teaching to blended (face-to-face) and online, to facilitate enhancement of the number of ICT students admitted and graduated to meet the increasing demand for ICT skills without expanding significantly the infrastructure and compromising the quality.

d. **Market driven curricula:** A move from curricula development approach, which is driven by the faculty, with little inputs from the ICT industry to market driven curricula, based on real needs of the industry in order to produce graduate ready for work with little transition costs. This requires enhanced involvement of the industry players in curriculum through a well-coordinated academic-industry collaboration as well as the development and/or establishment of a national ICT skills databases which would provide information on the skills that is available in the country and the skills gaps that need to be filled now and in future and which would be updated regularly. Due to the rapid technological changes expected in the digital area, the traditional 5-year curricula review cycle may not effectively apply to the ICT sector, flexibility in curricular review which enable incorporating demands for new skill sets is ideal.

e. **Practice oriented Faculty:** A move from the traditional academic oriented faculty to a faculty with blended academic/industry experience. This may require a system which allows faculty to spend some time in industry as well as use of industry professionals as part time faculty.

f. **Internship and industrial attachment:** A move from where industrial attachments and internship opportunities are available only to small fraction of the students due to limited space to that where the majority of ICT graduates secure such opportunities. This is only possible if industries move from providing industrial attachments and internships as corporate social responsibility to that where they do so based on incentives and expected tangible benefits.

g. **Involvement in training and certification by ICT industry:** An approach that provides policy incentives and guidelines to encourage participation of more ICT private players in the training and certification of ICT graduates.

h. **Recognition of prior learning and experience:** An approach that recognizes prior learning and experience in ICT fields for the purpose of certification.

i. **Talent Absorption:** Involvement of the private sector, development partners and NGOs in enhancing employability and opportunities for self-employment through job fairs, competitions, graduate programs, as well as access to new technologies and finance.

j. **National ICT Skills Database:** A talent cultivation approach which is guided by a national ICT Skills Database that informs curricula, other trainings, and job placement.

k. **Coordination:** An approach which coordinates all initiatives by government, development partners, private sector and NGOs, to expand the scope and outreach so that many Kenyans can benefit.

# SECTION FOUR

## CONCLUSIONS AND RECOMMENDATIONS

To realize the proposed ICT Talent Cultivation Approach, the following eight recommendations should be considered:

### 1. ICT Talent Cultivation Strategy

The existing policies and strategies are adequate to address the current challenges of ICT training and education. They are also adequate to cover all aspects of the proposed **ICT Talent Cultivation Approach.** However, the provisions related to talent cultivation are scattered in different policies and strategies and are being implemented by different agencies, making coordination difficulty. The only standalone strategy, ***National ICT Strategy for Education and Training (2006)*** is old and stakeholders would like it reviewed. There is need to consolidate all the enabling provisions on ICT talent cultivation in one reference document. The strategy needs to address specific issues identified in this white paper, and a strategic long-term approach is particularly necessary to support more women to get into ICT studies and careers.

Recommendation 1: The government, under the leadership of the Ministry of Education supported by the Ministry of ICT and other relevant stakeholders should develop an ICT Talent Cultivation Strategy by updating the existing National ICT strategy for Education and Training, 2006, and to operationalize the Digital Economy Strategy Skills and Values Pillar.

The strategy should identify how to enhance existing initiatives and set -up new initiatives to attract more students into ICT courses and careers, particularly for women, and enhance their skills at intermediate and advanced levels, to meet the expected future demand. This includes initiatives to upskill existing workers to meet industry requirements. Better use of online learning may be a critical channel for this. Such programs must also be targeted to make sure all can access them and no-one gets left behind, such as the disabled or those in remote areas.

### 2. Establish a National ICT Skills Database

The focus of the proposed **ICT Talent Cultivation Approach** is to reduce the mismatch in ICT skills between the supply from the tertiary training institutions and ICT industry. There should be a clear assessment of the kinds of skills needed for different types of workers in different sectors that can then inform training programs for such workers and calculations of future demand. Based on this, a standalone National ICT Skills Database that regularly document the ICT skills gaps in the industry and future skills requirements can be developed and used to inform the development of demand driven ICT curricula.

Recommendation 2: The government, under the leadership of the Ministry of Labor and Kenya National Bureau of Statistics and in collaboration with the Ministry of ICT and other relevant stakeholders should develop, within the National Labor Market Information System, a National ICT Skills Database, which should be updated yearly due to the rapidly evolving ICT technologies. It should be based on a clear assessment of the kinds of skills needed for different kinds of workers in different sectors that can then inform training programs for such workers and calculations of future demand.

### 3. Improve Academia-Industry collaboration and support for upscaling private sector initiatives and certification programs

Strong Academic-Industry Collaboration is important for ICT talent cultivation in various ways including curriculum development, student placement, staff engagement and consultancies, innovation and community-based initiatives. However, the current level of university-industry collaboration is rated low due to, amongst others, the absence of policies for incentivizing partnership efforts in the universities, lack of opportunities for ICT faculty to get industrial exposure in businesses, and lack of institutional and national support structures to coordinate establishment of such partnerships. There are several ICT talent cultivation initiatives and programs being offered by the private sector. These initiatives, which are undertaken

in collaboration with various government agencies, are making important contributions to ICT talent cultivation in the country. Some of these programs and initiatives, should be periodically reviewed to identify success stories and best practice for upscaling. Furthermore, the effectiveness and impact of these interventions can be enhanced if properly coordinated.

Certification of ICT professionals by ICT companies is a new approach of talent cultivation in Kenya and provides a huge potential for training, job placement and self-employment. The certification programs currently being implemented by Huawei ICT academies, IBM academies, SAP Skills for Africa Program and Microsoft ICT Skills Training in partnership with Kenyan universities, are unique and should be upscaled. However, this will require a framework to coordinate the establishment of the partnerships between these ICT industries and the universities and TVETs to ensure equity in terms of outreach to all existing universities.

Recommendation 3: There is a need to develop coordination structures to strengthen academia-industry collaboration including training and internships for faculty, and mechanisms to review, support, and scale-up success stories of such collaborations as well as other private sector programs including private sector certification initiatives. The government, under the leadership of the Ministry of Education and in collaboration with Ministry of ICT, could help facilitate such structures.

### 4. Revisiting the process of ICT curricula review

It is important to relook at the current review process and requirements due to the rapidly changing digital technologies, so that curricula can be reviewed faster to meet the needs of lecturers and students, and in collaboration with businesses and other stakeholders.

Recommendation 4: The government, under the leadership of the Commission for University Education, KNQA, CDAC and TVETA and in collaboration with the Ministry of Education and the Ministry of ICT should come up with modalities of fast tracking the review of ICT curricula.

### 5. Implement Policy Incentives for Private Sector Participation in ICT Talent Cultivation

The government, through the Education for Sustainable Development Policy for Education Sector (2017) and the National ICT Policy (2019), has provided for incentives to enable ICT companies to participate in ICT training and apprenticeship for students from tertiary institutions. The implementation of these policy incentives can significantly enhance talent cultivation in Kenya.

Recommendation 5: The government, under the leadership of Treasury, and in collaboration with the Ministry of Education and relevant stakeholders should implement the various incentives in Education for Sustainable Development Policy for Education Sector (2017) and the National ICT Policy (2019), to encourage ICT companies to participate in ICT training, industrial attachments, internship, and certification programs.

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# White Paper

## ICT Talent Cultivation for Kenya's Digital Economy

HUAWEI

unesco