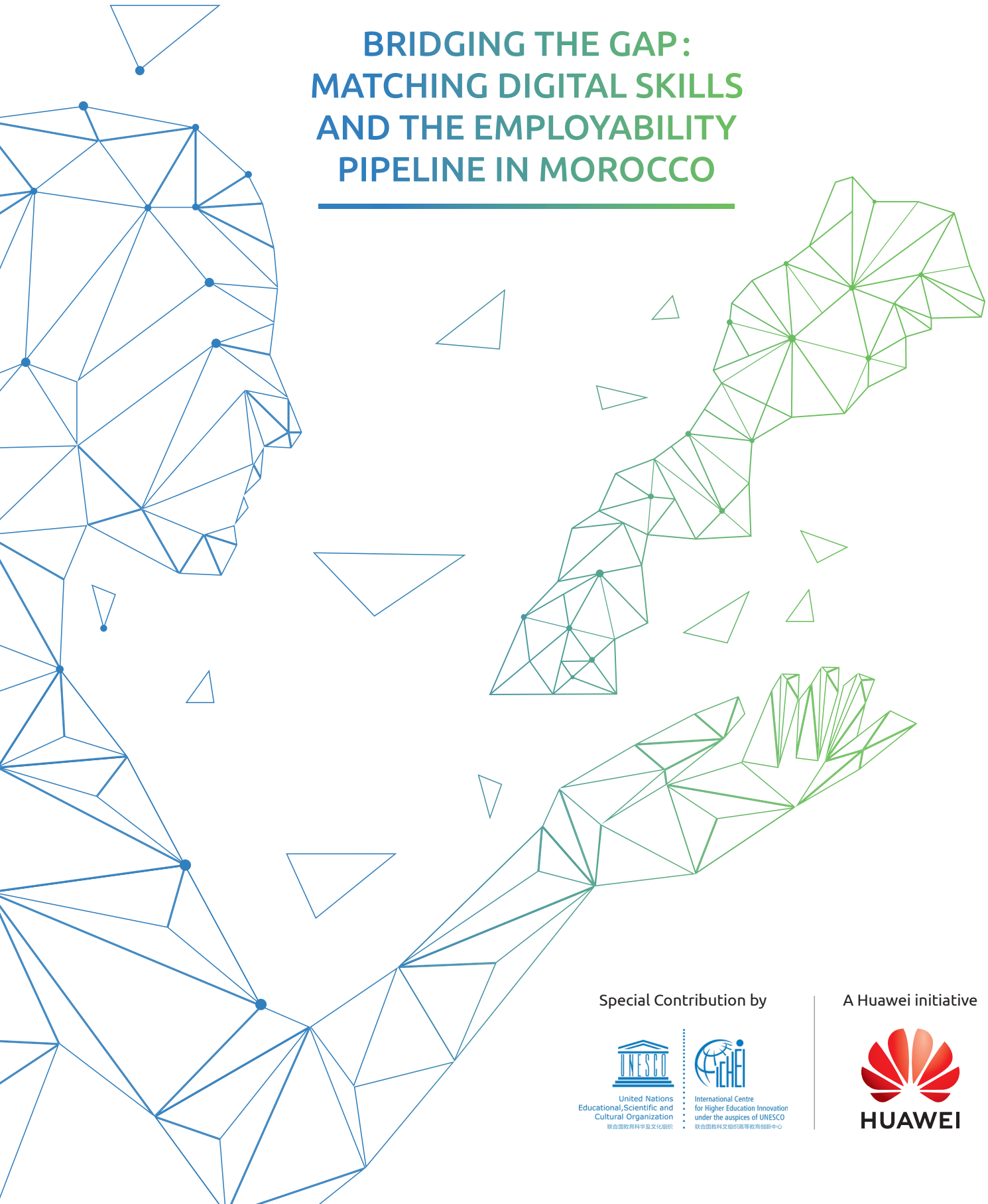
2021

Digital Talent Review

A Huawei initiative

BRIDGING THE GAP: MATCHING DIGITAL SKILLS AND THE EMPLOYABILITY PIPELINE IN MOROCCO



Special Contribution by

United Nations Educational, Scientific and Cultural Organization

International Centre for Higher Education Innovation under the auspices of UNESCO

A Huawei initiative

HUAWEI

"Africa is on its way to becoming a global digital laboratory. Spurred on by young people's ingenuity, creativity and audacity, digital technology is changing the face of our Continent. We owe this digital quantum leap to young startups operating in the fields of finance, telecommunications, industry and agribusiness, to name but a few. Often, those behind this innovative process are young people from low-income segments of the population. Our young people ought, therefore, to take center stage in our public policies."

His Majesty King Mohammed VI Speech to the African Union Extraordinary Summit on Continental Free Trade Area, Thursday 22 March 2018

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ACKNOWLEDGEMENTS

This Digital Talent Review (DTR) is part of Huawei's contribution to the Digital Talent Ecosystem development in Morocco. It shows its commitment to helping close the digital skills gap by finding new ways to empower the unempowered, so everyone can enjoy the same digital skills knowledge rights.

For the first time in Morocco, a strict measurement of the "Skills Gap", following a methodology inspired by best international practices allowed the authors to put facts, figures and strong data on what is considered as a key challenge to address by the Kingdom.

Strategy consulting firms Guepard and ThinkONE, with the support of Huawei Technologies wishes to thank all institutions and individuals that accepted to participate in this report and take part to the survey and panels organized to elaborate the recommendations and action plan. List of all stakeholders is available in the appendix section.

PREFACE BY THE DIRECTOR OF THE UNESCO INTERNATIONAL CENTRE FOR HIGHER EDUCATION INNOVATION

Professor LI Ming
Director of UNESCO-ICHEI

In recent years, with the rapid development of modern information technology, African countries have been collaborating with intergovernmental and non-governmental organizations to promote the development of digital skills. The African Development Bank pointed out in 2019/2020 that people should allocate more attention to emerging jobs. However, to date, limited engagement has been given to analyzing and identifying appropriate solutions. In many African countries, the higher rate of unemployment is partially due to the poor digital skills of the youth.

Morocco, one of the most dynamic economies in Africa, is facing the same problem HUAWEI recognized that Africa's growing information and communications technology (ICT) had created new economic opportunities for its talent, and it decided to make further investigations. It is the first research in Morocco on the current demand and supply of digital talent. It demonstrates that Morocco can benefit from emerging opportunities in the digital economy but need to upgrade its awareness of ICT through the development and the training of digital talents.

As a UNESCO Category 2 center, through multilateral cooperation with higher education institutions, ICT enterprises, education ministries, and relevant international organizations, UNESCO-ICHEI promotes the digital transformation of higher education by creating a supportive ecosystem of hardware and software for global partner higher education institutions, as well as by supporting ICT competency development for university teachers in African developing countries.

We believe that the results of this survey will help to upgrade the digital skills of Moroccan talent and also provide a direction for improving the solutions to digital talent development. We also call for more partners to participate in the digitization of Moroccan. We believe that, with joint efforts, Morocco's digital transformation will have a solid talent base.

TOMORROW'S DIGITAL AGE STARTS TODAY

In 2017, The Economist summarized in a puzzling sentence the 21st Century's biggest evolution: "The world's most valuable resource is no longer oil, but data" . For Morocco, a nation that has developed over the years without having fossil energy, this paradigm shift represents a huge opportunity, allowing the country to focus less on tangible capital and to invest more in the immaterial economy.

Strategy consulting firms Guepard and ThinkONE, with the support of Huawei Technologies,

got together to elaborate this Digital Talent Review, an initiative based on a broad analysis of the Kingdom of Morocco's assets, challenges, and solutions to bridge the gap between Digital Skills and the Job Market.

For more than four months, a dedicated team of 10 people conducted 30 high-level interviews, surveyed more than 600 key people, reviewed all relevant international reports and brainstormed with most stakeholders engaged in the digital transformation of Morocco, in order to build this Policy Paper.

For the first time in Morocco, strong and verified Data became accessible in order to identify hurdles and opportunities when it comes to critical digital skills and employability. The results, made available in this document, are eye-opening and can serve as an ICT Ecosystem roadmap.

Since the independence of the Kingdom in 1956, the Moroccan economy is predominantly service-driven by activities such as tourism, telecommunications, financial services and transportation, but it has industrialized rapidly during the last two decades, with fast-growing sectors such as automotive and aeronautics.

Furthermore, the World Bank believes that the cost of not embracing the Fourth Industrial Revolution would incur a loss of 2% of GDP for Morocco[2].

Consequently, Morocco has adopted during the last decade several national development programs of Digital. The Kingdom developed a cross-sectorial strategy for digitalization, and a "Digital Morocco 2020" plan was developed, succeeding the "Numeric Morocco 2013" plan. These programs allowed the creation of a dynamic, important in the sector and have translated into concrete achievements. In 2017, a dedicated Digital Development Agency (Agence de Développement du Digital[3]) was created in order to upgrade the governance and regulation of the digital sector. In December 2019, the board of directors of the agency approved the General Guidance Note for "Morocco digital 2025". The report recognized the lack of a comprehensive vision of digital transformation, the existence regulations barriers and a shortage of digital profiles. The document provides a detailed roadmap for the next five years that are analyzed in this report.

Through its 2025 digital plan, the country aims firstly to transform interactions with the public administration, via the end-to-end digitization of priority citizen / business journeys, making it possible to improve the satisfaction of citizens and businesses vis-à-vis the services provided by the administration in this context, with the objective of a satisfaction rate of over 85%.

Secondly to establish Morocco as a reference Digital & Technological Hub at the African level, with in particular a significant evolution in the United Nations Online Service Index ranking (objective to be part of the top 3 in Africa and to be among the top 40 at the global level) ; and the installation of over 2,500 startups over the next five years; Finally, the Kingdom wants to put Digital at the service of a more inclusive and egalitarian society with the reduction of the digital divide, the training of a new generation of 50,000 employable young talents and the development of specific initiatives in sectors such as Education, Health, Agriculture and Handicrafts.

According to the government, Morocco considers the digital sector as a key factor for its social-economic development, on three different components: allowing better quality interaction between citizens and administrations with its smart government, improving productivity and economic competitiveness of the business fabric (VSEs / SMEs, Auto Entrepreneurs and startups in particular) and reducing social inequalities.

The Kingdom initiatives to accelerate the digital transformation are aligned with the international institutions' recommendations. In February 2019, The City of Rabat (capital) obtained a EUR 562 million loan from the World Bank to support digital transformation of the economy. The support came within the framework of a broader partnership between Morocco and the World Bank, which seeks to harness the potential of digital technologies to enhance entrepreneurship, productivity and e-government initiatives to drive innovation and comprehensive development.

The World Bank new Country Partnership Framework for the FY19 FY24 period will focus more on private sector-led job creation, digital economy, and digital talents transformation, all with a gender-sensitive lens[4].

The World Bank considers that a modern digital economy would benefit young, small, and medium firms, for instance, expanding trade opportunities and allowing producers, retailers, and service providers to reach and interact seamlessly with customers located in remote markets.

Still, the Moroccan digital economy faces challenges such as broadband infrastructure penetration, one of the lowest

in the MENA region, while representing the main source of development potential in the telecommunication and ICT industries. Although, the country implemented a 10-year broadband strategy in 2012, the broadband penetration rate is among the lowest in the MENA region (17.5 percent of households for fixed broadband and 41 percent of the population for mobile broadband in 2015, whereas the regional average in 2015 was 41 and 85 percent, respectively), and is considerably lower than some Eastern European countries, where rates are close to 50 percent for fixed- line and 100 percent for mobile.

Overcoming the legal and regulatory barriers to a more competitive broadband market is a necessary condition for Morocco to take advantage of the possibilities of a modern digital economy[5].

On a regional level, according to the World Bank[6], the MENA labour market has so far been unable to address its enormous digital skills gap which undermines the region's potential for digital growth. This issue becomes a critical component of building the human capital MENA countries need, in order to capitalize on the push for economic transformation and generate workers and entrepreneurs capable of thriving despite global epidemic shocks like the recently COVID-19 pandemic.

Globally, the new division of labour between humans, machines and algorithms may generate at least 133 million new roles by 2022, according to the World Economic Forum[7]. In fact we expect a severe shortage in digital talents, according to Gartner study in 2020, 30% of Digital Jobs will be unfilled owning to digital talent shortfalls. Existing pool of Digitally Talented people are already so highly in demand that many large, traditional organizations must reinvent themselves to attract them. There will also be strong demand for emerging digital skills along with soft skills such as creative thinking, analytical skills, teamwork, problem-solving and negotiating. Looking for jobs can be tough for young graduates but developing a bank of soft skills is one advantageous way to boost employability. It is an ideal way for young graduates to highlight their value while they are stepping up to build critical digital skills.

Hence, digital skills are a vital national asset and can contribute to long-term economic growth for Morocco's youth and future generation. They help businesses transform and become agile, increase productivity, innovation and profitability needed to compete globally. They allow public services to provide the quality and the choices that people want. They also help individuals raise their employability, and achieve their ambitions for themselves, their families and their communities[8]. According to a World Bank's study, 10 % increase in broadband penetration yielded an additional 1.21% in GDP growth in high income economies and 3.19% in per capita GDP in low- and middle-income economies[9].

Digital skills are not only crucial nor beneficial; they became a condition for the future of every economy. Yoram Eshet-Alkalai -a professor in the Open University - defined digital literacy as a "survival skill in the digital era"[10]. In Morocco, creating the right conditions to align interests of students, educators, policymakers, tech companies, investors, universities and schools should become a national priority in order to ensure that the country doesn't miss the next technological revolution.

This is the ambition of the Digital Talent Review, which main objectives are the following:

1. Seek a comprehensive study and analysis of the digital skills currently needed and projected in Morocco's Digital Sector as well as other key vertical Sectors as a whole.

2. Present strategic insights based on the analysis and supported by sound statistics and data.

3. Identify and narrow the gap between the Digital market requirements and the Digital skills supplied by the academic organizations and universities

4. Question the current education models with inputs and analysis from Industry perspectives.

5. Develop key digital talent development recommendations to the related Moroccan Government Ministries or Agencies involved in Digital Talent Development programs aligned in accordance with Morocco's government development initiatives.

As OECD stated in its "Digital Government Review of Morocco": "Morocco should capitalize on the current momentum to make further progress in establishing an adequate governance framework as well as mechanisms for coordinating digital transformation efforts across the public sector[11]" . The Digital Transformation comes with a lot of challenges to many countries. It bring innovation to all sectors not just for the ICT sector alone, but cutting across different vertical sectors such as Banking and Finance, Oil and Gas, Public Sector, BPO/ITO and others. The new disruptive and emerging new ICT technologies, together with the slow adaption rate, lead to widening of the digital skill gap between three different groups: digital leaders, digital professionals and digital users. It is necessary that each group have the right skill sets and proficiency levels in order to deal with the fast changing trends in the digital transformation process.

For decades, Morocco has been famous for its world-class athletes when it comes to Marathon, Semi marathon, and long-distance runs, winning gold medals in several Olympics.

The Kingdom will now need to enter the speed race in digital skills for tech.

[2] https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data
[3] Study on Unlocking the Potential of the Fourth Industrial Revolution in Africa-Country case-Morocco- African Development Bank-August 2019
[4] www.add.gov.ma
[5] FY2019-2024 Country Partnership Framework for the Kingdom of Morocco-World Bank- Jan 2019
[6] Creating Markets in Morocco - Country Private Sector Diagnostic - World Bank-October 2019
[7] https://blogs.worldbank.org/arabvoices/5-things-MENA-countries-can-do-to-design-better-digital-skills-development-programs
[8] The digital skills gap is widening fast. Here's how to bridge it -World Economic Forum - 2019
[9] 21st Century Skills Realising Our Potential - UK Government – 2003
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[11] Building tomorrow's digital skills - what conclusions can we draw from international comparative indicators? -UNESCO-2018

EXECUTIVE SUMMARY

Why analyzing the gap between digital skills and the employability pipeline in Morocco Matters?

Digital skills became a critical part of any national digital strategy to promote economic and social development. However, many nations have developed strategies which focuses on promoting the development of technological infrastructure without considering the skills needed to use, build and manage it[12]. In this context, Morocco is no exception, for the Kingdom allocated a lot of efforts to physical infrastructure over the last two decades.

This imbalance has created what has become known as a "gap" between available digital talents and the employability pipeline. In short, Morocco has not been able to provide enough workers that are digital ready to the Market demand, thus destroying value and missing the opportunity to become a "digital nation".

Moreover, digital skills are not only related to technology job roles, they become essential for every aspect of life and work. They have become transversal and essential to nearly all workers. Countries that implement comprehensive digital skills strategies ensure that their populations have the skills they need to be more employable, productive, creative, and successful while ensuring they remain safe, secure and healthy online[13].

Globally, firms increasingly require complementary skills and competences for new organizational forms and in digital-intensive sectors. Meeting these needs is particularly challenging for SMEs and the public sector which tends to face severe competition for digital skills. Many of these digital skills are not only crucial for firms to thrive, but more generally crucial in a digital world of work and a digital society[14].

In addition, Digital can play a leverage role in the development of education sector in Morocco to give access to education, particularly to underprivileged populations, by integrating e.g. quality training courses in numeric classes, including in remote rural areas. The Digital Leverage can help mitigate socio-economic inequalities by democratizing Internet access and by registering the technology as a development vector of rural territories, particularly in agriculture, being given that nearly 40% of the active population still lives from the agricultural sector.

Therefore, having a clear structured digital skills framework strategy will help Morocco achieve its digital goals set in its 2025 digital plan. This report aims precisely to contribute to the strategic thinking of Morocco in order to reduce the digital skills gap.

The report shows first that not only the challenges are international, but the competition is as well. With that regard, it was essential to address the "elephant in the room" and what is believed to be the most disruptive technology to come: 5G. By 2025, the market value of 5G consumer services will increase to US$ 238 billion, the value of 5G industry digital transformation will exceed US$ 600 billion, the market value of 5G connectivity applications will reach US$ 232 billion, and the market value of 5G non-connectivity applications will reach US$ 370 billion[15]. Therefore, since the challenges are international and shared, although at different levels, we believe that one of the best ways to tackle digital skills gap is through the Industry-Academic-Government Cooperation Model.

In this international dynamic, Morocco has started at least for 15 years its journey to prepare for the digital world. Although it has limited resources, Morocco had been very innovative and an early adopter for many initiatives and strategies, but the development of the digital economy suffers from different barriers, including lack of a unified vision and structural fragmentation in decision-making.

Key findings: lack of clarity and awareness, geographic concentration and brain drain

For the first time in Morocco, this report scanned the current demand and supply digital talent insights as the core focus. The authors also conducted an analysis considering both the international situation and the Kingdom's context. Thus, a dual approach was chosen, combining quantitative and qualitative aspects. The main objective behind this dual approach was to reduce biases with an independent analysis outlook with the support of a strong scientific base. On the qualitative level, 30 extensive individual interviews were conducted with stakeholders from the digital ecosystem. On the quantitative level, key data and insights were collected from 3 specific targets (Chief Human Resources Officers & ICT managers, ICT students and ICT workforce), totaling more than 800 sources.

The results of the study are striking. First, the digital skills gap is enhanced and supported by a fracture in levels of awareness between stakeholders. On one hand +85% of the CHRO's state the needs in ICT Talent profiles pipeline will increase in the next five years. On the other hand, 38% of those already in the job market and 50% of students express a negative outlook and pessimistic views about the current job market.

70 % of the responses are neutral to very unclear and only 3% have a clear idea about all the existing jobs and recruiting companies in ICT. Also, there is a low diversification in terms of decentralization, gender diversity and diversity of profiles, creating a "Moroccan ICT desert".

Zooming into the brain drain, we observe that +70% of students want to leave Morocco in the short/medium term mainly motivated by lack of opportunity in the near-term, need to learn new skills, low wage level and slow career progression rather than monetary considerations.

While this is an international trend, it is still a national concern and a paradox. In fact, +70% of ICT recruiters face difficulties to find talents especially experienced and middle-management people (digital leaders, digital professionals), and 45% complain about the lack of soft skills, while young generations are not aware of their soft skills gap, ~75% claiming to be ready in terms of soft skills and linguistic skills. Finally, looking into education and training, we found out that most acquired skills of the workforce are learned through professional certifications (60%), followed by workplace learning (52%) and Self-teaching (49%). Beyond education reform, diplomas must therefore be revisited into something not permanent and school-to-work transition must be open and flexible.

To that effect, the Digital Talent Review developed a unique framework: "The Digital Skills Matrix" to have a full spectrum analysis of digital skills set in Morocco. Comparing the gaps between the industry needs, embodied by the workforce and human resources leaders and the academic offer led to gathering areas of misalignment between these 3 stakeholders. 80 programs identified with 500 digital related courses were confronted with the industry's digital skill needs coming from the study. Each category of ICT Domain is highlighted with the Critical Skill set requirements along with similar compatible digital job roles, ending with the Industry-Job-Outlook within Morocco and region. Thus, this Digital Skills Matrix is our proposed tool to develop key and specific digital talent development recommendations to the related Moroccan Government Ministries or Agencies involved in Digital Talent Development programs aligned in accordance with Morocco's government development initiatives.

The main takeaway is that Morocco can benefit from emerging opportunities in the Digital Economy but will need to upgrade its value proposition in ICT based on a clear offering of good quality and agile digital talents at competitive costs. However, the growing rate of turnover and the lack of highly specialized resources, correlated to an increase in salaries can impact negatively the competitiveness of Morocco in the ICT sector vs other countries (Maghreb, Sub-Saharan Africa, etc.). While upskilling and reskilling using vocational training as the main tool, Morocco will need to target more complex emerging digital technologies and premium specializations in the value chain to break the current pattern.

Key recommendations: crystallize, converge, grow

The findings from the survey and interviews served as a scientific base to elaborate actionable recommendations, classified according to the 4 main stakeholders of digital skills development: students and workforce, businesses, education system and public decision-makers.

This enables tools that can be used to push towards the long-term vision of developing the Moroccan Digital Economy. The 'Digital Skills Matrix' can be used to develop "National Digital Skills Framework" that will include the emerging digital job roles profiles and career path along with the critical skills and competency knowledge. Finally, the establishment of a "Digital Talent Bank" will help graduates find the first job more easily.

However, scrutinizing our study results and listening to the main stakeholders, we have found that the strategy is about making more sense of what is already there, integrating what already exists and focusing it more effectively.

The vision

CRISTALLYZATION

which means to align main stakeholders around the project

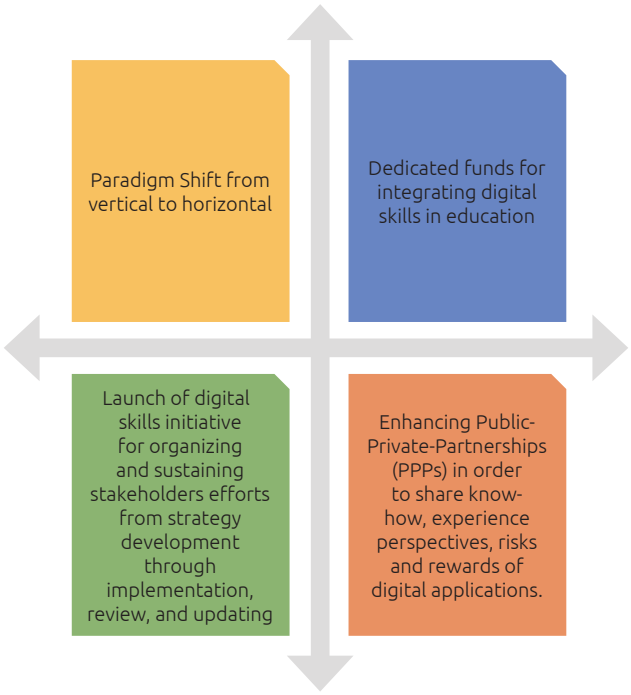
AMBITION

to bring a real added value by narrowing the Digital Talent gaps that will support medium-to-long term Morocco ICT-Ecosystem growth

SIZE MATTERS

the digital skills competition is international so the input and participation of national champions in business and education should be supported in order to promote innovation and to help technology startups to emerge

The implementation of this vision needs the following actions



This is why a Digital Skills Initiative is needed from a strategic level to bring key players with the government to drive the digital skills delivery plan. As digital skills strategies needs to be updated regularly to respond to the emergence of new technologies and their impact on the digital economy and digital society. This makes one-size-fits-all policies incompatible with digital challenges.

Successful delivery of any strategy will depend on cross-government collaboration, agencies and local organizations and more engagement and communication with companies, private sector representatives and academic institutions.

At the execution level, several key questions remain unanswered to date, that could be partly resolved following the path described below.

The global reset imposed by Covid-19 and the ongoing work on the new development model represent a historic opportunity for Morocco to take the bull by the horns and make a shift towards digital economy and become the region's digital champion.

With a strong belief in collaboration and partnerships, Digital Talent Review is a first step to start a new journey with all stakeholders embarked.

[12] CUKIER, Wendy, SMARZ, Shelley, GRANT, Ken. Digital Skills and Business School Curriculum [Online]. 2017. Available on : https://conference.pixel-online.net
[13] EUROPEAN CERTIFICATE OF DIGITAL LITERACY FOUNDATION. The Role of Digital Proficiency as a 21st Century Competence [Online]. 2012. Available on : https://ec.europa.eu
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DIGITAL SKILLS: THE BIG PICTURE

1. International challenges and competition

Digital skills become necessary for every aspect of life and work. From filling in a government form to communicating for work, it is difficult to find a job or life-task that does not require a basic level of digital functioning. Moreover, with new technologies emerging every day, we need lifelong opportunities to learn new skills that will allow us to succeed in an era of ongoing digital transformation[16].

The benefits are economical as well. For example, EU is running a Digital Single Market that could contribute by €415 billion per year to the EU economy and create hundreds of thousands of new jobs[17]. Nowadays, digital skills are not only related to technology job roles. They have become transversal and essential to nearly all workers who are expected to be able to operate the technology related to their role. The changes brought by the EU's Digital Single Market strategy offer a new opportunity to put the EU's relationship with the Southern Mediterranean on a new footing. This was discussed during the high-level stakeholder Digital4med conference on April 8, 2019 in Brussels, which focused on areas that can have the biggest impact and where the EU has relevant experience and demonstrated expertise. The EU's External Investment Plan (EIP) will mobilize €44bn of investments for Africa and the EU Neighborhood, through an EU contribution of €4bn. Twelve EU guarantees worth around €800m have been approved, including technical assistance funding of €74m for a Digital Transformation Platform & Broadband Investment Program, designed to increase the use of digital technologies, and widen rural access to broadband[18].

The success of firms in the digital era not only depends on workers with good literacy, numeracy, problem-solving, and generic ICT skills used at work but also increasingly requires ICT specialists and data specialists. In addition, firms increasingly require complementary skills and competences for new organizational forms and in digital-intensive sectors. Meeting these needs is particularly challenging for ICT Startups, SMEs and laggard firms, notably in certain sectors, including the public sector, which tends to face steep competition for skills. Many of these skills are not only crucial for firms to thrive, but more generally crucial in a digital world of work and a digital society19.

The digital skills gap is without any doubt a great challenge of the 21st-century, recognized as such by most governments and multilateral organizations.

To illustrate this, the ICDL Foundation[20] led a study in seven countries: Austria, Denmark, Finland, Germany, Switzerland, India, and Singapore. The results of the survey showed that digital skills gap exists in all these countries, predominantly amongst young people as well as their older counterparts, and that people who have acquired digital skills certifications perform better than those without any certification.

There is a shortage of digital human capital in MENA, marked by skills and information gaps. For example, in its 2017 Future of Work study[21], McKinsey found that across the region, only 1.7% of the workforce is digital talent[22]. In their last 2017 skills survey of the region, Bayt/YouGov[23], a leading jobs website in MENA, revealed that IT jobs are among the top open positions, evidence of an acute talent and skills shortage in the region. The Gulf countries are the most advanced in terms of digital transformation. Yet, GCC countries still have a significant digital skills gap[24].

Analyses undertaken by the African Economic Outlook point out that in many middle-income countries, high job vacancy rates prevail despite large scale unemployment, suggesting that the skills gap also drives youth unemployment in countries like Morocco[25].

In its country private sector diagnostic report, the World Bank presents the following digital skills illustration[26] :

Figure: The Digital Skills Pyramid

Source: In World Bank Group 201X based on European Commission (2004), van Welsum and Lanvin (2012)

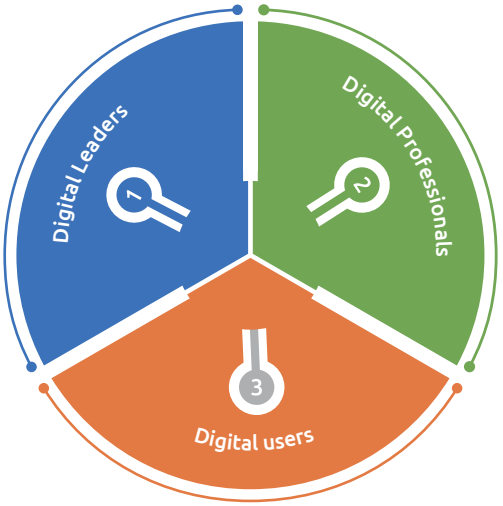
Awareness of the value of digital skills has been rising internationally. For the first time in Europe, the "Upskilling Pathways: New Opportunities for Adults" initiative officially recognized that digital literacy is of the same level of importance as reading, writing, and numeracy[27].

1.1. "Digital transformation is less about technology and more about people."

The only certain fact about the future is that it is going to be disruptive. Thus, it is essential to look at both infusing the right skills to kids during their curriculum and supporting reskilling and upskilling of people. In this new world, some old jobs will disappear, but some new ones will disappear as well.

The digital transformation comes with a lot of challenges to many countries. It brings innovation to all sectors not just for the ICT Sector alone, but cutting across Manufacturing, Finance and Banking, Public sector and changes the way how people interact with each other, conduct daily activities and business dealings. The new disruptive and emerging new ICT technologies, together with the slow adaptation rate, lead to widening of the digital skills gap between the three different groups: digital leaders, digital professionals and digital users

It's necessary to provide support to each different group with the right skills set and proficiency levels in order to deal with the fast-changing trends and landscape in the digital transformation process



1 Digital Leaders

Group having an influence on the organization of ICT planning, policies, design, and implementation according to the ICT Trend, industry demands, allocation of budget and ressources.

2 Digital Professionals

Group that provides direct development, support, integration & test in to the backbone of ICT operation of the organization and ensure quality and SOP are align with organization and client objectives.

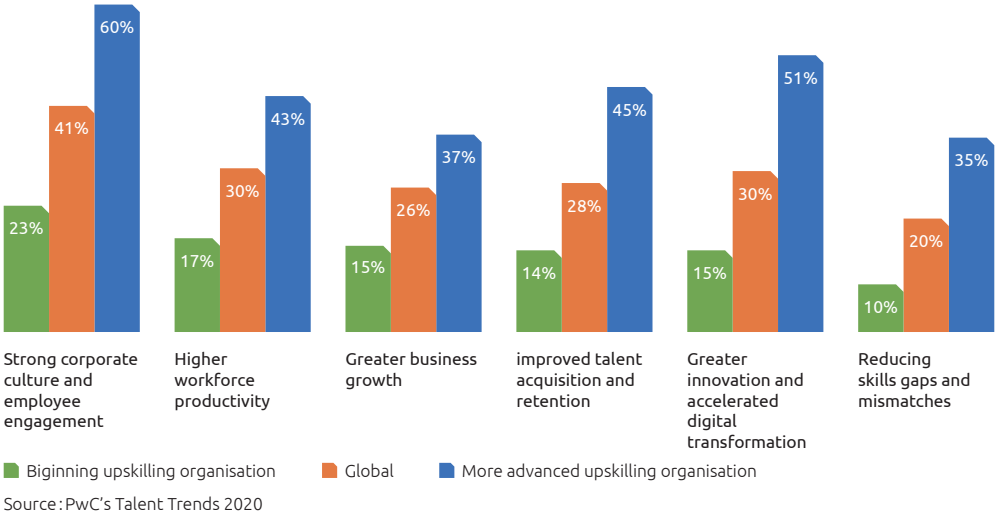
3 Digital Users

Groupforming biggest pool that directly uses the ICT Platform Services, and their products. This group can influence trends and the market insight.

[1] https://www.pwc.com/gx/en/ceo-agenda/ceosurvey/2020/trends/talent.html#:~:text=PwC's%2023rd%20Global%20CEO%20Survey,the%20spread%20of%20COVID%2D19.&text=Today%20that%20same%20lack%20of,in%20a%20post%2Dpandemic%20economy.

While Massive Open Online Courses (MOOCs) with both static and interactive contents have emerged as an accessible and affordable distance-learning tool, certifications and micro-credentials that recognizes skills independently from years of completed education are critical, rapid, and flexible ways to respond to the market demand[28].

How effective are your upskilling programmes in achieving the following outcomes? (showing only 'very effective')

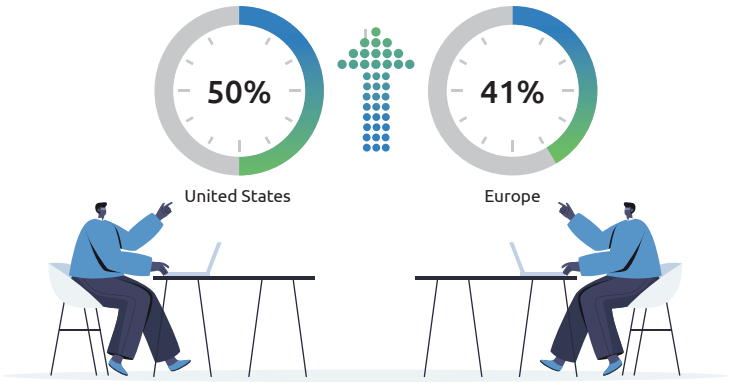


Source : PwC's Talent Trends 2020

The "PWC talent trends 2020"[29] report draws two main lessons from its survey results: first, the full benefits of upskilling programs take time to emerge; and second, the benefits (at earlier stages, at least) are complementary to filling the skills gap. It is the positive organizational impact that emerges first. 41% of CEOs surveyed by PWC said that their program has been "very effective" in creating a more robust corporate culture and improving employee engagement than reducing the skills gap, and that rises to 60% for CEOs who had invested more significantly in their upskilling program. Only one in five CEOs said their upskilling program has been "very effective" in addressing the skills gap so far, but among companies with more advanced programs, that share rises to 35%.

Some striking numbers

Time spent using advanced technological skills will increase by :



The need for advanced IT and programming skills will increase by

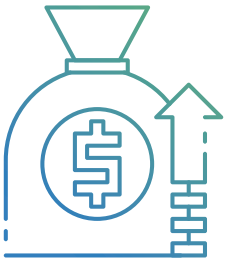
50 PERCENT
of the world economy

1.2 BILLION
employees

US$14.6 TRILLION
in wages will be affected by automation technologies

▶ Half of these totals will be in just four countries: China, India, Japan, and the United States.

▶ The automation potential of a country depends on the structure of the economy, the relative level of wages, and the size and dynamics of the workforce[31].



Disruptive digital technologies can contribute on average

1.1%
to annual GDP growth in the period 2017-2030.

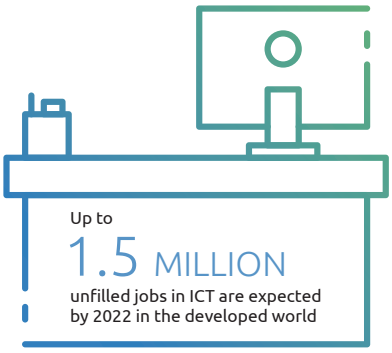
The cumulative effect is

14.1%
higher GDP by 2030 as a result of these technologies

or

€ 2.2 TRILLION
in the EU states[32]

9/10
jobs will require digital skills[33]



Up to

1.5 MILLION
unfilled jobs in ICT are expected by 2022 in the developed world

$11.5 TRILLION
is the potential cost of the digital skills crisis across

14
countries of G20[34].

70%
of Digital Transformation initiatives failed, but the cost of doing nothing is worse[35].

74%
of CEOs taking part in the 23rd Annual Global CEO Survey by PWC said that a lack of availability of the right skills is a concern[36].

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1.2. The Elephant in the Room: How 5G will impact Digital Talents in the next decade

5G is here, and as we enter a new decade it is poised to be one of the most life-changing technologies to come around in decades. The technology is even growing faster than initially thought, which means more businesses and individuals will have access to it in less time than imagined[37].With its low latency, high multi-Gbps peak data rate speed, high reliability and huge network capacity, massive changes are coming fast down the pipe.

However, 400 million people around the world are not covered by any network and therefore have no access, most of them in the rural areas, which limits the impact of the 5G revolution.

Furthermore, 2 billion people are covered by networks but are not using mobile internet because of other barriers, including affordability of devices and data plans, readiness (illiteracy and lack of digital skills), as well as the relevance of online content. According to the experts, improvements in literacy and digital skills could help an additional 300 million people to go online[38]. This means that the immaterial aspects of 5G are at least as important as its material investments.

On a continental level, Africa needs up to $100bn by 2030 to bridge its connectivity gap. With the pending economic crisis expected to have damaging consequences, investment in digital technology and digital infrastructure is urgent and a condition for African economies to bounce back[39]. Moving closer to the MENA region including Morocco, given the trend that governments and multinational organizations are investing towards 5G trials and pilots in preparation for roll-outs between "2021-2025", the race is on for telecom engineers to learn new critical skills.

The advent of 5G Technology is expected to create a huge potential for both industry players and digital talent within the Digital Ecosystem. These sectors are moving into the digital sphere - a data-enabled, cyber-secured, software-driven virtualized network that leverages the mobile spectrum and end-to-end fiber connectivity to the maximum extent. However, this requires understanding of both technical and economic values it will bring. It requires not only investing in 5G, fiber, network functions virtualization (NFV), and software-defined networking (SDN) but also transforming the operating model to include up-skilling existing Digital Talents pool with new critical skillset and knowledge competency. In fact, many Telecom and IT operators foresee the need to transform their operating model to capture the full-benefits of the next-generation digital network and align with the required investment strategy. In actual fact, many 3G and 2G infrastructure networks are already marked for the retirement phase.

With data speed, 5G Network is also expected to handle increased volumes of traffic leading to huge demand particularly for skills like Business Analytics, Artificial Intelligent (AI) and Machine Learning (ML).

The adoption of newer skills will not only act as a positive catalyst for opportunities for youth and graduates within the Telecom and IT sector, it will have a major effect across vertical industries in the medium to long term.

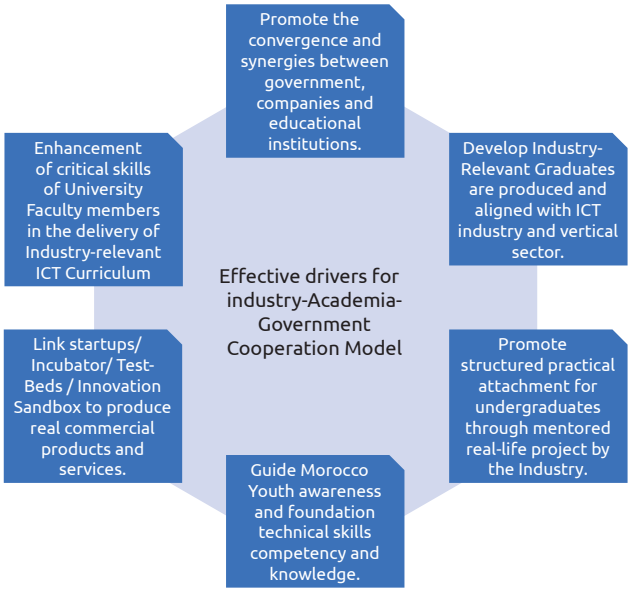
However, the demand for critical skills and the launch of 5G are unlikely to come all at once, and instead it will be incremental through LTE Advance, and LTE Advance Pro, as a result, a huge demand for 5G ready engineers is expected.

In addition to skills, countries need to put up collaborative ecosystems to ensure sustainable growth towards intelligent connectivity. These Ecosystem Stakeholders are composed of five roles: Decision Makers (countries, organizations or enterprises), Data Scientists, ICT Companies, Data Collectors, and End Users.

Decision-makers will need to understand the roles of the ecosystem's various stakeholders to develop viable growth strategies for their own countries and industries to participate. Understanding how to participate and leverage the strengths of the collaborative ecosystem is crucial for policymakers and industry leaders that aim to deliver sustainable growth for their country or organization[40].

Scaling up connectivity services requires skills and resources that stretch beyond any single player. To span this gap and promote the convergence and synergies between government, companies, and education institutions it is possible to look at the 'Industry-Academia-Government Collaboration (IAGC)' model. The effective drivers of this model are:

Figure: Effective drivers for industry-Academia-Government Cooperation Model



Zooming into Morocco, the country faces a dilemma when it comes to promoting and scaling up 5G skills within its current student body and Tech workforce. As the survey shows[41], the historic brain drain wave to Europe from Morocco is accelerating, in a context where the EU is perceived as "Loosing the 5G race"[42] . Thus, it is expected that European Tech Companies will intensify their efforts to bring in developers from North Africa and specifically from Morocco.

Furthermore, according to our research, the Moroccan education system will need to transform rapidly enough to educate and train 5G ready future workforce.

The stakes are indeed enormous. Many of the 5G related jobs will require technical knowledge understanding on topics such as Network Slicing, Massive MIMO, C-RAN, Mesh Networks, SDN/NFV, etc.

This technical knowledge will help support the deployment of telecom operators 5G networks especially during the launch phase. The study indicates that part of the first wave of 5G opportunities is in the creation of jobs to support the network infrastructure deployment and optimization.

However, our survey of key CHRO's in Morocco shows clearly a discrepancy between actual needs and future needs. For example, only 4% of CHRO'S that 5G core network skills are important and 6% believe that 5G RAN will be important in the near future. This contradicts clearly the viewpoint of students and current workforce, who both agree that 5G will be a real catalyst for the development of ICT in Morocco, with more than 62% enthusiasts. But one of the most counterintuitive results of the study shows that despite the perception gap between recruiters/ HR on one hand and students/workforce on the other, all communities agree that 5G certifications are absolutely essential. With that regard, Huawei is perceived as the reference number 1 provider of the 5G technology (~80% amongst CHROs/ICT managers & Students/Workforce) vs. Cisco (~45%).

This creates an immense challenge in order to reconcile agendas of recruiters/HR departments and students/ workforce in the future[43].

Therefore, to ensure Morocco has a strong pipeline of digital talents who are ready to hit the ground, government leading agencies such as Morocco Agency for Digital Development (ADD) and key Universities can establish consortiums to coordinate programs to develop digital skills across the country's 5G ecosystem including telecom operators, enterprises, and technology firms.

Also, the right path should be opened to continue to work closely with the Industry to equip Moroccan Workforce with the right critical skills so that future Youth and Graduates can secure future jobs as demand grows in emerging areas like 5G. A strong and digitally skilled Moroccan Workforce together with 5G infrastructure and trials, are essential to expand Morocco's capacity for Innovation, with a good position to capitalize on the exponential growth of its digital economy to come.

In short, Morocco will have to face a double challenge in order to prepare its youth and graduates ready with 5G. First, it will have to make its Tech sector bigger and more attractive to retain digital talents. Second, its global education system will have to integrate more rapidly the 5G paradigm change.

3. Overview of International Cooperation

Multilateral organizations have produced abundant literature on the topic of Digital Skills and transformation. Here are some of them that have a direct link with Morocco, or that are relevant for our topic.

3.1. Multilateral initiatives

The European Commission's New Skills Agenda for Europe has encouraged each EU Member State to develop its own comprehensive national digital skills strategy. The shared concept document provides a guide for writing, revising and improving national strategies, particularly to address digital skills gaps in Europe. It contains a discussion on challenges and possible solutions, as well as a wide variety of best practices, with sections focusing on education and training; citizens and the labour force[44].

3.1.1. The European Union-African Union Digital Economy Task Force (EU-AU DETF)

The Digital Economy Task Force provides a platform of partnership for the private sector, donors, international organizations, financial institutions and civil society based on a shared understanding of how an already fast-evolving African digital transformation can achieve cross-border integration and bring benefits to all citizen.

"By 2045, the African population aged 15-24 will reach 400 million. An estimated 15 to 20 million increasingly well-educated young people are expected to join the African workforce every year for the next three decades. Digital technology is generating a high demand for qualified, local workforce, not only in the ICT industry but also across all sectors that could benefit from digital transformation including in terms of cost-effectiveness, inclusive access and reach, as well as growth. However, companies of all sizes in Africa struggle to find a qualified workforce. Employers across Africa identify skills gaps as a significant constraint to their ability to compete in the global economy"[45].

3.1.2. The World Bank

According to the World Bank experts[46], the MENA labour market has so far been unable to address its enormous digital skills gap which undermines the region's potential for digital growth. It becomes a critical component of building the human capital MENA countries need in order to capitalize on economic transformation and generate workers and entrepreneurs capable of thriving despite shocks like the COVID-19 pandemic.

The World Bank identified five elements to consider when designing digital learning interventions:

Figure: Five Elements of Effective Digital Skills Programs

1. Skills development reforms integrated at all levels of the educational pipeline
2. Comprehensive reforms focus on both policy and programmatic levels
3. Top-down vision and commitment are present to ensure enabling ecosystems and content
4. Capacity is seen as a determinative factor of success
5. ICT infrastructure is recognized as a valued component

In Morocco, the World Bank approved in June 2020, a US$500 million Financial and Digital Inclusion Development Policy Financing (DPF) program, which will support key policy

reforms to promote an enabling environment for digital transformation[47].

The program will also support Morocco's response to the COVID-19 pandemic and lay the foundation for recovery. It will support government efforts to enhance financial inclusion outlined in the National Financial Inclusion Strategy; and accelerate the development of an accessible, quality, and affordable digital broadband service over the Moroccan territory[48].

« Today, more than ever, digitalization opens new opportunities for Morocco, ranging from more fluid economic transactions to better services to citizens and businesses," said Jesko Hentschel, World Bank Maghreb Country Director. "*Through the current support, we aim to boost this potential and leverage digital transformation for more inclusive growth."*

Digital connectivity, the backbone of the current reform, requires the availability of a reliable, safe, and competitive digital infrastructure. "It is especially critical to promote digital inclusion across the country so that no one is left behind, including in rural areas. This requires reforms to further promote competition and investment in order to expand access to broadband services. Access to broadband infrastructure proved to be vital for business continuity during the crisis and will play a key role in the post-COVID-19 economic recovery," said Arthur Foch, Senior Digital development specialist and co-Task Team leader.

3.1.3. Smart Africa Alliance

In December 2019, Morocco joined the Smart Africa Alliance. With a vision to create a single digital market in Africa by 2030, the Smart Africa Alliance brings together Heads of State who seek to accelerate the digitalization of the continent and create a common market. Launched in 2013 by seven African Heads of State, the Alliance now has 30 member countries, representing over 750 million people and over 40 Private Sector members committed to the vision and the advancement of Africa. One of the quick win under the alliances, to offer 'Smart Africa Scholarship Fund' to member countries in order to bridge the skills and talents gaps to make Smart Africa goals a reality. The scholarship target critical need to build skills in the ICT sector to realize sustainable economic development across member countries. Each Member States contribute USD 200,000 each on a one-off-basis into this pool of fund with the aim to select the scholars based on the criteria's required by the Smart Africa Scholarship Fund program.

3.2. International recommendations

3.2.1. The EU-AU Digital Economy Task Force recommendations[49]

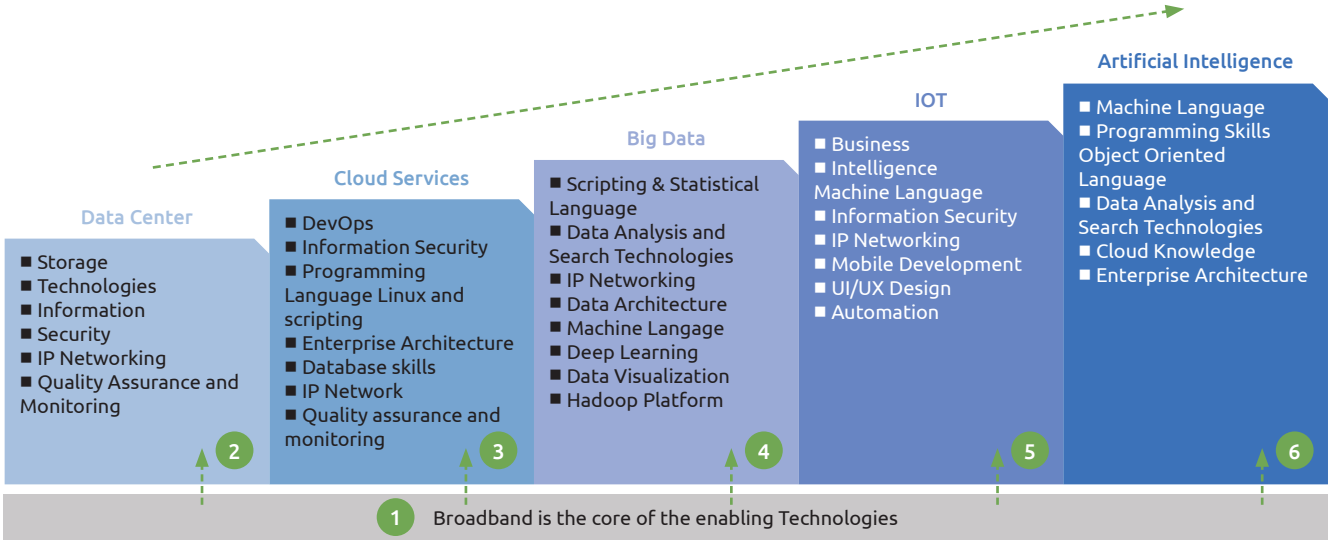
By 2045, the African population aged 15-24 will reach 400 million. An estimated 15 to 20 million increasingly well-educated young people are expected to join the African workforce every year for the next three decades. However, companies of all sizes in Africa struggle to find a qualified workforce. Employers across Africa identify skills gaps as a significant constraint to their ability to compete in the global economy[50].

The EU-AU Digital Economy Task Force (DETF) was launched on 18th December, 2018 to provide a platform of partnership for the private sector, donors, international organizations, financial institutions and civil society based on a shared understanding of how an already fast-evolving African digital transformation can achieve cross-border integration and bring benefits to all citizens[51].

The DETF draws policy recommendations and proposes concrete actions to address the principal barriers faced by the African continent as it seeks to develop the digital economy and society. We selected below the main policy recommendations and proposed actions proposed by the task force:

- Engage public stakeholders, private companies, international donors, universities and NGOs, set up clear Key Performance Indicators (KPIs) and a dedicated expert group.

Figure:Enabling technologies and broadband



- Provide support for capacity building of policymakers to allow them to identify opportunities for the digital economy at large, and e-services more specifically.

- Promote learning opportunities delivered by public and private partners for workers across all sectors, including VET, on-the-job training and rapid-skill- training as well as knowledge sharing and mentoring within national and regional innovation hubs.

- Ensure that training initiatives targeting existing and future workers across all sectors, including ICT professionals, encourages computational thinking, 21st-century skills and provides advanced digital skills. Allocate dedicated funding mechanisms for skills development training and supporting instruments to do training at all levels more inclusive and affordable.

- More public provision of technology and broadband Internet connection to educational institutions.

- Support the establishment and scale-up of online higher education institutions.

- Establish a capacity development program to support African policymakers, regulators and other public sector representatives in taking digital-by-default decisions on digital and transversal skills development, including on AI and its human rights and ethical implications and exchanging knowledge of new connecting technologies (i.e. satellite, Wi-Fi, LTE 5G). This should be done in dialogue and collaboration with the private sector, ultimately contributing to creating a favorable business environment.

- Develop dedicated funding mechanisms for digital and transversal skills development training.

- Set up incentive mechanisms and develop a regional qualification framework for African institutions to become centers of excellence delivering training on ICT in line with market needs and based on knowledge sharing between European and African partners.

- Create a system of fiscal incentives for companies offering basic, functional or advanced digital skills training.

- Promote the enhancement of digital skills through advanced in-company training and on-the-job training, after education and capacity building.

3.2.2. OECD main policy recommendations[52]

In 2018, OECD published a report to analyze the efforts to integrate digital technologies in the public sector and to provide policy advice to support the Kingdom of Morocco in implementing a strategic digital government policy. Some of the key recommendations of the review are to:

- Establish a national chief digital transformation officer (CDTO), with a clear mandate, political support and an institutional basis, to be a champion of the digital transformation of the Moroccan public sector.

- Establish an inter-ministerial committee responsible for the oversight and coordination of digital government initiatives.

- Develop institutional instruments to streamline digital technology investments across the public sector, namely a budget threshold for ex-ante evaluation, a business case mechanism and a standardized project management model.

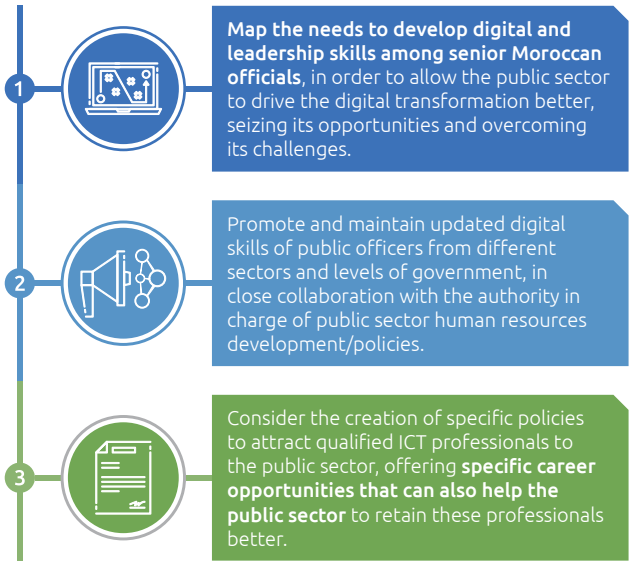
- Develop a mechanism for evaluating ICT investments, establish an ICT commissioning policy and consider developing an open-source and open standards policy.

- Develop digital skills among Moroccan public officials, identify the skills needs of civil servants and leaders, and consider creating specific policies to retrain, attract and retain qualified ICT professionals among the public sector workforce.

Specific actions proposed by OECD for Digital Skills gap:

Figure: Specific actions proposed by OECD for Digital Skills gap

Prioritize the development of digital skills among the Moroccan public officers able to support the sustainable development of digital government, namely:



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UNESCO-ICHEI

UNESCO International Centre for Higher Education Innovation (UNESCO-ICHEI) aims to support Asian and African countries to improve the quality of higher education and promote educational equity through utilising Shenzhen's advanced ICT sector and China's experience in the massification of higher education[53].

a) IIOE (Online Learning Portal)

The International Institute of Online Education (IIOE) is another flagship project of UNESCO-ICHEI. In December 2019, UNESCO-ICHEI, together with 11 Asian and African partner HEIs, 4 Chinese universities, and 9 ICT enterprises,jointly initiated IIOE. Since the launch of the IIOE online learning platform in April 2020, it has made 184 courses in Chinese, English and French available as open educational resources (OERs), covering a wide range of topics, such as Computer Science, Artificial Intelligence, Big Data, Cloud Computing, the Internet of Things, Blockchain Technology, including courses at the foundation, intermediate and advanced levels.

The IIOE online courses and programmes and the SCR facility offer both software and hardware support for the digital transformation of partner HEIs and ICT capacity building of their teachers and administrators. On the one hand, teachers and administrators can participate in online training and develop online courses at the Smart Classroom for joint knowledge production and resource sharing. On the other hand, SCR also provides a shared digital teaching and learning environment for both the teachers and students, so they can apply what they learned in the same setting.

3 dimensions of IIOE Competency Framework:

- Online and Blended Teaching and Learning
- ICT-enabled Administration and Management
- EmergingICT skills in Industries for Higher Education (Big Data, AI, Cloud Computing, IoT, Blockchain etc.)

b) Smart Classroom Concept (SCR)

Since 2017, The Smart Classroom Program (SCR) is a significant program under the 'Digital Education Link' with the aim to build infrastructure facilities between UNESCO-ICHEI's and the Higher Education Institutions (HEI's) partners in African and Asian countries. The program intends to strengthen the capacity of designing and implementing online and blended teaching and learning (OBTL), and accelerate digital transformation of their higher education system.

Through the Public-Private-Partnership (PPP) with leading Chinese Educational Technology Enterprise, UNESCO-ICHEI has been able to donate and establish smart classrooms at partner Higher Education Institutions (HEIs). The Smart Classroom is a digital learning environment that integrates emerging information and communications technology (ICT) domain, such as Big Data, Cloud Computing, the Internet of Things (IoT), Computer Vision and Artificial Intelligence to support multimedia teaching and learning, localised curriculum design, cross-campus resource-sharing, learning analytics, administration and management, among other requirements for realising the digital transformation of HEIs.

Each Smart Classroom facility can accommodate 50 students for lectures, seminars, training, forums, workshops, among other functions The Smart Classroom consists of both hardware and software components, such as an interactive touch panel, student terminal (laptops, all-in-ones or cloud desktops), a server, an uninterruptible power supply (UPS) unit, a recording and broadcasting system, a wireless visualiser, wireless microphones, and network switches and related accessories. Besides, SCR is also powered by the inbuilt Learning Management System (LMS) that provides support for learning analytics, which creates SCR facility as a user-friendly, smart and interactive learning environment.

UNESCO-ICHEI has planned for 3 phases of the Smart Classroom Project, totalling 12 projects in Asia countries and 16 in Africa countries including Morocco. The first phase of SCR Project is being implemented at 12 partner HEIs. The second phase of the SCR Project will establish 6 Smart Classrooms in Malaysia, Myanmar, the Philippines, Senegal, Morocco and Cote d'Ivoire by the end of 2021. While the third phase will establish 10 Smart Classrooms in Nepal, Bangladesh, Laos, and seven countries in sub-Saharan Africa, West Asia and North Africa. The third phase is expected to begin in 2022.

Fonction of the SCR

- Create a shared digital learning environment for teachers and students to realise ICT-driven inonovative teaching and management.
- Narrow the gaps in educational resources for HEIs in developing countries to propel the transition to online education.
- Connect the global HEI networks to facilitate knowledge production and resources sharing.

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The Smart Classroom at UET Lahore, implemented in July 2019, is the first SCR project implemented by UNESCO-ICHEI. Since then, more than 80 hours of lectures have been recorded at the Smart Classroom, and it has been in use for almost 700 hours. Teachers at UET Lahore havr recorded 24 Computer Science lecture at the SCR , provinding learning content for undergraduate and graduate students during the COVID-19 pandemic. SCR also supported academic exchange during the pandemic, in wich UET Lahoreorganised three academic seminars on Blockchain Technology, the internet of things (IoT) Security and Machine Learning. Furthermore, UET Lahore implemented the National Vocational Training Programme with SCR, including courses on Artificial Intelligence, Data Science and Computer Vision.

Smart Classroom at Ain Shams University ASU Egypt is also the first SCR implemented By UNISCO-ICHEI in Africa. Since its establishment in january 2020, SCR has provided timely solution to addressing the education disruption caused bu COVID-19. As the first rotating Chair HEI of IIOE, the president of ASU personally led administrators to participate in the operation training of SCR. Before the outbreak of Covid-19, ASu held teaching for students with Disabilities Workshop and World Design Studio Video Conferences Sessions at the Smart Classroom in Februry and March. Since then, 18 professors at ASU has recorded ten online courses (about 54 hours) at the Smart Classroom, ensuring education contuinity for more than 200,000 students during the Covid-19 pandemic.

UNESCO-ICHEI has developed an implementation plan of SCR through multi-stakeholder partnerships. The aim is to ensure smooth implementation of each project and integrate SCR into the teaching and learning processes of HEIs partners. By joining forces with its partners, ICHEI can integrate resources, expertise and competencies better to promote all ICHEI's missions and functions, achieve common development goals, and to strengthen visibility and impact of its action. At present, ICHEI has built relationship with governments, other intergovernmental organizations, NGOs, private sector companies, universities, and UNESCO institutes and centres with the hope to strengthen with the following recommendation.

By joining forces with its partners, ICHEI can integrate resources, expertise and competencies to promote all ICHEI's missions and functions, achieve common development goals, and to strengthen visibility and impact of its action. At present, ICHEI has built relationship with governments, other intergovernmental organizations, NGOs, private sector companies, universities, and UNESCO institutes and centres with the hope to strengthen with the following recommendations:

a. Seeks to incorporate mobile learning, Massive Open Online Courses (MOOCs) and blended learning to unlock the potential of higher education.

b. Introduce the new International Institute of Online Education (IIOE) project, encourage involvement and collect feedback from multiple stakeholders.

c. Establish expertise for programme delivery through joint design and implementation of activities at national, regional or global levels

d. Coordination and consultation on the elaboration of programmes and on development of policies, standards and norms.

e. Sharing outreach capacity and specific networks to support UNESCO's advocacy and policy dialogue in its priority areas and countries.

f. Providing and benefiting from technical assistance and advisory services

c) High Level Onsite Training

UNESCO-ICHEI also provides enriched teaching and practices through High Level Onsite Trainings which covers topics such as :

- Core courses, General courses, and Practical courses
- ICT application in higher education
- Big data and cloud computing
- Information management system (IMS) in HEIs
- Online teaching and learning
- Artificial Intelligence
- Internet of Things (IoT)

Field visits are another example of onsite practices provided by UNESCO-ICHEI. For instance, seminars organized by the organization have provided opportunities for participants to visit top Chinese companies in respective fields and gain insights of how they interact with HEIs in China. These opportunities also allowed participants to engage with these companies for potential collaboration.

d) UNESCO-SHENZHEN Fund-In-Trust (SFIT)

The UNESCO-SHENZHEN Fund-In-Trust (SFIT) was created with a view to contributing to improve Talent Development programs in African and Asian countries through various initiatives such as :

SFIT in Asia Seizing Digital Opportunities in Higher Education	**SFIT in Africa** Strengthening HE Quality Assurance System in Africa Key Components
■ Building staff capacity for ICT-driven Innovation in Cambodia and Sri Lanka	■ Support the establishment of new quality assurance agencies in Côte d'Ivoire, Mali, Niger, Togo, and Zambia ■ Institutional capacity-building of recently established QA agencies in Egypt, Gambia, Malawi, Namibia, and Senegal ■ Consolidate existing Quality Assurance Networks in Africa, including the African Quality Assurance Network (AfriQAN) and the East African Quality Assurance Network (EAQAN)

MOROCCO'S JOURNEY IN THE DIGITAL SKILLS SECTOR

KINGDOM OF MOROCCO

Ministry of National Education, Vocational Training,
Higher Education and Scientific Research

"We strongly encourage the publication of documents and reports such as this Digital Talent Review, which represent, undoubtedly, a qualitative contribution to the development of an ecosystem allowing the emergence of young talent in the digital field in Morocco.

As a matter of fact, today and more than ever, we are called upon to reconsider our references so that the pedagogical approaches and the didactic tools provided to the learners are the most adapted to their individual needs and concerns.

The latter require learning experiences that encourage their development and involvement, notably through individualized and personalized cycles relying on immersive formats that stimulate the imagination, while using multimodal and multi-media approaches.

Given this context, Morocco has been working for several months now to rethink its entire pedagogical organisation when it comes to Universities, at the center of which is the student.

This new architecture will be more focused on pedagogical practice and mastery rather than on disciplinary knowledge, and will give a key position to Skills, while taking into consideration all multiple forms and facets it implies.

This pedagogical shift aims to revise the Hard Skills-Soft Skills dialectic, reconstruct it with a view to making learning more beneficial for the student, thus enabling him/her to become more autonomous, more employable and more integrated into his/her socio-economic environment."

Anass Bennani
Cooperation and Partnership Director
Ministry of National Education,
Vocational Training, Higher Education
and Scientific Research

1. Government initiatives

1.1. ADD: the main institutional locomotive of the Moroccan digital development

Numeric Morocco 2013 (Maroc Numeric 2013) and Digital Morocco 2020 (Maroc Digital 2020) are the two comprehensive strategies aimed at revamping the digital economy.

As a result, The Digital Development Agency (ADD) was created in 2017 to execute Morocco's Digital Strategy for government services, private sector and citizens' access to social services, medicine and education. It aims to reduce the urban-rural digital divide, promote the digitization of business processes and achieve a shift from e-government to digital government.

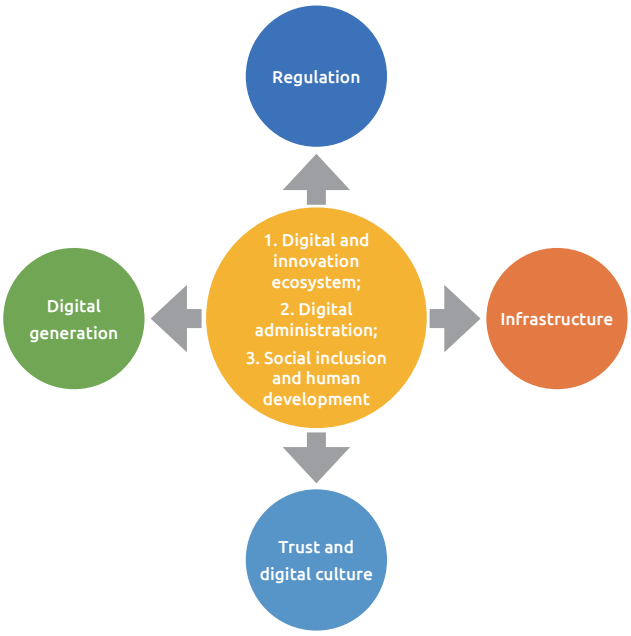
"The goal is to work alongside both the public and private sector to digitalize the national ecosystem, with a focus on administration, business and society", told Mohammed Drissi Melyani, CEO of the Digital Development Agency to Oxford Business Group[54].

Since its creation, the agency is very active launching public-private partnerships (PPP) with different organizations, many of them the Moroccan ICT federation « Fédération marocaine des Technologies de l'Information, des Télécommunications et de l'Offshoring » (APEBI) about the participation to the Mobile Payment Forum, Africa IT Expo, as well as a roadmap of vocational training programs with ministries of industry and education and the « Confédération Générale des Entreprises du Maroc » (CGEM) and the international payment card « E-commerce » for companies operating in new technologies with "Office des Changes", Moroccan Office of Industrial and Commercial Property (OMPIC), "Caisse Centrale de Garantie", CGEM, and "Groupement Professionnel des Banques au Maroc" (GPBM). Al Akhawarizmi program is another of its projects aimed for the support of research in Artificial Intelligence and its applications in partnership with Ministries of Industry and Education and National Center for Scientific and Technical Research. ADD also signed a memorandum for the creation of digital interactive center in Benguerir with ministries of industry and education, Mohammed VI Polytechnic University, USAID and EON Reality.

The agency announced 14 projects in 2018. During the 3rd board of directors of the agency on December 2019, the Chief of Government highlighted ADD initiatives such as Digital Lab, which is an incubator for digital projects; the creation of a platform dedicated to startups and the digital academy to train 3000 professionals per year towards digital jobs[55]. Digital PME and digital auto entrepreneurs announced that they will provide online digital audit.

During the same meeting, the board approved the General Guidance Note for "Morocco digital 2025". Through this new strategy, the agency is willing to achieve 3 main goals which are to establish a successful digital administration at the service of citizens and businesses, a competitive economy thanks to the performance gains brought about by a digital and innovation ecosystem and finally an inclusive society thanks to digital. ADD identified four conditions for the creation of an ecosystem that enables digital development: training program to create a "digital generation", continuing progress on digital infrastructure (among them 5G), adapting the regulation framework and creating digital and trust culture.

Figure: ADD's 3 strategic components and 4 transverse pillars



Source : Note d'Orientations Générales pour le Développement du Digital au Maroc à horizon 2025- Chef du Gouvernement

The agency is positively perceived by international institutions and partners like OECD[56] and the World Bank. In addition to be a clear commitment by the Kingdom towards digital economy, it has also enhanced private companies to invest in digital projects. In September 2020, Fes Euro-Mediterranean University, the General Confederation of Moroccan Companies (CGEM) and Alten announced the "Fez Smart Factory" project[57].

The 4.0 industrial zone, co-financed by the Millennium Challenge Account Agency-Morocco and the Fund for Sustainable Industrial Zones (Fonzid), is aimed to create 5.000 highly qualified jobs. However, the agency will require a clear mandate and sufficient means to provide oversight, promote uptake, and monitor and evaluate progress in implementing Maroc Digital 2020 (OECD 2018)[58]. In fact, ADD states in its general guidance note the need of a clear governance model and monitoring tool.

The digital transformation of government in Morocco is gradually taking place in various sectors of activity but its pace remains slow compared to countries of the Gulf Corporation Countries (GCC). Many e-government initiatives have been implemented during the past 10 years. Nevertheless, the e-services deployed are not yet meet the expectations of citizens and of companies due in particular to the lack of end-to-end digitization of operations and the lack of ergonomics of sites.

1.2. Tertiary Vocational Education : the strategic priority

In July 2019, The National frame of certification (CNC) "an institutional validation in the service of learning and

employability" said Saïd AMZAZI, was launched by the Ministry of National Education, Vocational Training, Higher Education and Scientific Research. The organization was created in order to:

- Help put the country in a position to face economic challenges and social today and tomorrow
- Place the individual at the center of the training system by facilitating continuity and progression of his career throughout his personal and professional life
- Allow a dynamic connection between the training offer and the needs expressed by the labor market
- Facilitate both sectoral and geographic mobility
- Ensure better fluidity of training courses and passages in a sector to another and from one level to another
- Implement a quality assurance system for the certifications offered young people and adults

In 2019, King Mohammed VI announced the creation of "Cities of Trades and Skills". The idea is to define for each of the 12 regions in Morocco's job roadmap and to identify the excellence sectors that should be developed in these regions, to promote the professional integration of the local talent pool. "The aim of these projects is to provide quality training according to new material and pedagogical criteria which guarantee a certain convergence between the training provided and the real needs of the labor market and contribute to the promotion of the image of vocational training as a lever for development, employment and social inclusion." Said Loubna Tricha, director of The Office of Vocational Training and Work Promotion (OFPPT)[59]. In February 2020, King Mohammed VI launched the construction works of the City of Trades and Skills Souss-Massa. It is a diversified offer, oriented towards new professions, which includes 60% new sectors and 40% restructured sectors. The main trades selected concern the sectors of Industry (21 branches/760 trainees per year), digital & offshoring (12 branches/520 trainees per year), management & commerce (5 branches/240 trainees per year), tourism and hotel business (10 branches/515 trainees per year), and construction (5 branches/180 trainees per year). The sectors of health (7 branches/260 trainees), agriculture (7 branches/145 trainees per year), fisheries (7 branches/220 trainees per year), agro-industry (10 branches/420 trainees per year) and handicrafts (4 branches/160 trainees per year) are also covered. On September 2020, the Office launched the construction work of its 5th City in Laayoune. All the cities which started construction works are scheduled for the start of the 2021-2022 training year.

OFPPT and French Telecom firm Orange agreement is another example of a win-win public-private partnership. The objective is to develop a curriculum for jobs training programs on fiber network installation and maintenance needed to connect 1 million households to the network over four years[60]. At the time of the signature, in April 2019, Morocco had only 400 technicians and 50 engineers specialized in fiber network for a market that will need 2.500 job creations per year for the next 5 years[61]. King Mohammed VI has put vocational training as a priority to reduce unemployment and to encourage the development of Moroccan regions

1.3. Morocco's digital strategy for the promotion of youth employment[62]

To increase the number of users - particularly young people- and improve the quality of services without incurring higher costs, Morocco's National Agency for the Promotion of Employment and Competencies (ANAPEC) has developed a digital strategy based on web-based, telephone and digital media tools.

A web-based portal offers various services related to labour market intermediation, including registration of job seekers and vacancies, and personalized pages for employers and job seekers. Websites are providing general labour market information and more specific information on self-employment and on opportunities for jobseekers to improve their employability. In addition to a text messaging service and call centers, ANAPEC uses various social media and mobile apps to disseminate information and e-learning materials.

A second project was launched for the period 2020-2023 in partnership with the Belgian Development Agency (Wehubit), "Fondation Marocaine de l'Éducation pour l'Emploi", Fundación Educación para el Empleo, Accenture España, Dell Technologies Morocco and MEDZ (CDG Group). With a budget of 300.851 euros, the project fosters inclusive economic growth and spurs competitiveness in Morocco's digital economy through demand-driven skills training of young job seekers directly linked to gainful employment opportunities in the booming IT sector. This will be achieved through a blended training program composed of online digital training and in-classroom soft skills and technical training in computer programming[63].

2. Initiatives in the education system

Despite many initiatives to integrate Digital Skills in schools, many studies showed that appropriation by students is very limited[64]. Structural obstacles were identified within the nature of the Moroccan education system; the strategy and implementation of ICT programs as well as skills and professional development of teachers. Although infrastructure is one of the obstacles, but it could more easily overcome than culture linked to the paradigm of what is being a student today and what is being a teacher.

Almost all Moroccan universities are equipped with materials, but the main problem is the motivation and appropriation of the students and teachers. Below a list of initiatives launched in the last 15 years by the Moroccan government:

1.1.Main Initiatives

a) Vision of Education Reform 2015-2030

With a view to develop a new strategic vision for educational reform, the Higher Council for Education, Training and Scientific Research has taken the initiative to engage in broad consultations, calling on the various actors

and partners of the School, to departments responsible for education, training and scientific research and to national competences.

of education starting from primary school, with dedicated programs. The program has complemented key milestones like training of 87% of the educational management and staff, 900 main trainers, 148 ICT training centers and

Table: Education Reform vision in different areas[65]

Approach	Vision
Engineering & Pedagogical	■ Adopt for the engineering of each level of different types of teaching (school, higher education, traditional education, executive training), a referential and cognitive framework that defines its functions ■ Define a common basis of learning for each cycle that will be the referential framework of knowledge, capabilities and core competences that the learner must master by period ■ Diversify pedagogical approaches, and adapt them to different teaching, learning and training situations ■ Focus the pedagogical relationship on the interaction with learners and among them, encouraging initiative and innovation, effort and pedagogical autonomy
Vocational Training	■ Preparing the necessary, skilled, human resources for education, training and management ■ Articulate in a better way the complementarity between theoretical and practical training by fostering, in particular, alternate training, in partnership with the economic stakeholders ■ Broadening the offer of vocational training by increasing its enrollment capacity and extending/strengthening its services to rural and remote areas ■ Creating career paths that start from the "middle school" (intermediate stage) and lead to vocational high school degrees ■ Review the pedagogical, vocational and university orientation system to develop a new vision based on development of professional activities
Institutional Arrangements	Reinforce the integration of educational technologies by developing a national strategy which put them at the service of quality learning on the curricula, programs and training levels since the early school years, thanks to various digital media, interactive programs and networks
Evaluation	Create a national certification framework able to adequately organize and classify diplomas according to a clear and transparent referential grid that will guarantee the credibility of diplomas and promote greater mobility of graduates at national and international levels

b) GENIE

Along with the National Strategy for the Generalization of Information and Communication Technologies in Education (TICE), the ministry of education introduced the « GENIE » program in 2006 in partnership with the ANRT & the ministry of digital economy, with a budget of 1 Billion MAD. The objective is to introduce digital learning technologies among schools in Morocco in the rural & urban areas, starting from primary school by training the professors and administrative staff

Four levers were defined for in this program:

- Digital infrastructure: installation of multimedia environments connected to the internet
- Training: several training modules are planned for the educational and administrative staff (inspectors, teachers, directors)
- Digital resources: acquisition of digital resources and creation of a national laboratory of digital resources and a national ICT portal
- Usage development: support to all users

In this context, teaching basic coding fundamentals knowledge seems to be a current priority for the ministry

120 000 people to use computer tools and development of four modules following UNESCO competency framework. In terms of digital resources, the National Laboratory for digital resources distributed digital resources to schools, created several dedicated portals and developed over 300 Open Educational Resources. The program was awarded the 2017 UNESCO King Hamad Bin Isa Al-Khalifa Prize for its work in making innovative use of Information and Communication Technologies (ICTs) in education but still faces natural resistance and maintenance of the equipment as two of the main challenges, according to its Director, Ilham Laaziz[66].

c) INJAZ

Injaz consists of acquiring fixed or laptop computers with a preferential price, a modem and a free broadband connection for one year, for all administrative staff, teachers and students in technical and master's fields, all specialties included.

d) LAWHATI

Lawhati is aimed at all post-baccalaureate students enrolled in Moroccan higher education and vocational training institutions as well as Moroccan students abroad. It is also aimed at teaching staff from universities and vocational training instructors. The objectives of the project are to encourage the sharing of knowledge and collaborative

networking, facilitate the access of learners to digital services and resources, generalize ICT in the Moroccan University, integrate the use of ICT into university teaching (training, evaluation, research), modernize teaching practices and improve training systems and promote interactions between students and teachers.

e) MARWAN

Marwan (Maroc Wide Area Network) seeks to interconnect all Moroccan universities and educational establishments. The project is dedicated to education, training and research. Its new latest version offers universities access to high-speed internet (between 2 and 100 Mbps) thanks to its connection to the network "GEANT" reserved only for academic traffic.

1.2. MOOCs

a) MarMOOC

Launched in 2019, MarMOOC, the new phase of the Moroccan MOOC (Massive open online course), is considered to be the first Moroccan platform dedicated to the dissemination of free online courses. A dozen massive open-line courses (MOOCs) and six private online courses for small groups (SPOCs) will be taught in areas considered to be priorities: economics and business management, law, science, engineering, fisheries, agriculture, and health.

The MarMOOC project brings together 14 Moroccan and European partners united in a consortium. On the Moroccan side, the participants are Abdelmalek Essaadi University (Tetouan), Ibn Tofail University (Kenitra), Moulay Ismail University (Meknès), Ibn Zohr University (Agadir), the International University of Rabat, Private University of Marrakech, and the Ministry of Higher Education. The coordination and financing of the project, estimated at nearly one million euros, is provided by the European part which brings together the universities of Vigo and Leon (Spain), Brussels (Belgium), Sofia (Bulgaria), the University Pierre-et-Marie-Curie de Paris, the Royal Institute of Technology in Stockholm (Sweden), and the Network of Universities of European Capitals (Unica).

Moroccan universities participating in the future MarMooc project will be able, in future years, to implement a teaching and blended learning approach, combining traditional teaching and distance learning, using the latest technologies of the education such as MOOCs and SPOCs[67].

Therefore, the MOOCs face lack of cultural appropriation and motivation by teachers and leaners who expressed dissatisfaction about MOOCs. Some solutions suggested are to assess the needs of learners and elaborate a framework to organize work between the educational institution, teaching team and learners.

b) MUN Platform

This platform, the first of its kind in Morocco and at the continental level, intends to seize the digital opportunity to offer open and massive online courses (commonly called MOOCs) and private online courses for small groups (called SPOCs).

Four missions were set for this initiative:

1. Support the development of training courses that take full advantage of digital leverage and are accessible to as many people as possible

2. Encourage placing digital technology at the heart of the student career and of higher education and research professions

3. Provide shared resources and services to support the digital initiatives of establishments

4. Promote the visibility of the Moroccan offer of training and digital resource

The MUN platform is currently offering training content in various fields: education and training, computer science, economics and finance, engineering sciences, basic sciences, health, management, entrepreneurship, environment, human sciences, languages, and law. The primary goal is to allow Moroccan universities to overcome the challenges they face, through a modern and innovative pedagogy offering everyone the possibility of consolidating their knowledge, acquiring new skills and boosting their employability in the labor market.

3. Private sectors initiatives

Yet fragmented, the private sector has been instrumental in developing several initiatives when it comes to digital skills. According to our analysis, there are around 20 initiatives, led by 14 institutions, with a sufficient scale in order to reach the target.

The Confederation of Moroccan companies, CGEM, the ICT Federation (APEBI) and the Association of Information System Users in Morocco (AUSIM) had been active on this topic and has released many studies, work papers and recommendations. APEBI alone launched 6 projects to digital skills development.

APEBI acted as a stakeholder for the preparation of both 2013 and 2020 strategies and visions. The ambition of the organization is to position Morocco on new jobs internationally, help create Moroccan ecosystems, increase the sector's sales, attract more foreign investments and create more jobs[68].

4. Public-Private partnerships within training centers

Public-private partnerships are recent in Morocco's culture, although they work pretty well abroad when it comes to digital. They can form the cornerstone of a successful move to digitization and are an effective strategy for bringing together the resources and know-how needed to deliver on digital skills development. Size matters and both local companies and international ones are engaged in projects with the academic ones.

Approach: Co-construction initiatives in collaboration with the government & other stakeholders such as international organizations

Digital 4 All
Connect APEBI members to market opportunities through B2B meetings in different sectors and regions

Institutions 2 Meet
Develop a strong lobby for APEBI members vis-à-vis public institutions, with a view to setting up a Digital Doing Business

MoroccoTech 4 Africa
Launch of an African confederation of information technologies to position APEBI's members on the continent

Microsoft
Certification of teachers allowing them to stay updated on new technologies and innovation in the ICT field

Data 4 Tech
Establishment of a permanent ICT observatory, to make data on skills available for example

IBM & Microsoft
Offer communities and solid partnerships with companies & start-ups

Happy Coders
30 hours per week of coding training for 6th year primary school students

SEAF
- ODB 'observatory of Branches I Observatory of Trades and Skills of Professional Branches) whose mission is to support Branches and Professional Associations in anticipating the effects of multifactorial changes, developing development plans and the modalities of their implementation
- Other projects that are supported by different commissions, around entrepreneurship, on subjects like digital where the entrepreneurial aspect is discussed

Webhelp / Crédit Agricole
Donation of second-hand machines following the modernization of the call center IT infrastructure

CISCO
Has long-term partnerships with schools in Morocco "For 10 years they have certified our promotions"

MT
"Code Scretch" which is a fun introductory coding program for young people from primary school level

HACKOVID TECH
Create pragmatic and useful solutions quickly responding to the major challengers of the national effort against COVID-19

Skills 4 All
The rapid development of human capital via a training institute project for the conversion of ICT education into PPP / Delegated management

HACKOVID TECH
Create pragmatic and useful solutions quickly responding to the major challengers of the national effort against COVID-19

Institut Français du Maroc
Launch of the Médiaschool (digital school newspaper) competition, with the bonus of an internship in France for the teacher who produces the best multimedia content for his school or class

MTC CAPITAL
- In collaboration with OCP a business angel was created, called "MNF angles" for tickets over 1million dh, supporting also smaller companies.
- 2 to 3 startups are presented every month.

Digital Knowledge City
Online digital profession university, a general platform that will allow all those who produce and offer training content to publish it. The goal is to make labeled and certified training accessible and to promote the orientation of students.
It will be managed by professionals and recruiters in the market such as APEBI, AUSIM.

Zakoura program
Providing hardware to students and teachers to create 100% digital school in rural areas

Orange
Training of students in rural areas and remote regions on qualitative coding throughout the year

SAP
Introduction of the "Africa Code Week" initiative to introduce 4 million Moroccan students to coding thanks to the provision of 20 company employees for training

LEGO
Through the "Play Academy" brought to Morocco by 2 young EMI laureates specializing in educational robotics and teaching coding languages to the youngest

Figure: UEMF R&D center in partnership with ALTEN

7 pillars of Euromed
1. Multilingualism: fluency in at least a third foreign language (+French & English)
2. Multiculturalism: course on intercultural dialogue, history, civilizations, philosophy and critical thinking
3. Mobility: a study stay of 6 to 18 months in the Euro-Mediterranean area
4. Digital environment: widespread use of ICT and digital technologies
5. Entrepreneurship: courses and projects on entrepreneurship, innovation & communication
6. Social responsibility: realization of projects credited with social and societal impact
7. Sustainable development: hybrid courses between engineering, economics, law and human & social sciences on tools and issues related to the protection, preservation and enhancement of the environment & sustainable development.

Skills For All
- Training or retraining on short cycles for profiles that are not sharp or hyper specialized (whatever the background) to become coders, data scientists or computer scientists
- Instead of hiring bac+5 engineers, Bac+2/+3 profiles are reconverted after 6 months in a specialized field

Upgrade Program
- Create collaborations with companies (such as Alstom, Intel, BMCE) in order to give bac+3 employees the opportunity to enroll in training (evening or weekend courses) allowing them to upgrade their level, to reach a bac+5 level

Bachelor Program
- Ongoing project with the government, for more flexibility in the program with mandatory major modules but also a variety of optional modules chosen by the candidate. The purpose is to avoid setting a single model but a personalized one

Partnerships
- Executive masters, not necessarily recognized by the State, which content is adapted to the needs of the company asking for it, such as ALTEN & CGI
- ALTEN Boost : work-study training program for engineers with a bac+5 in different fields who are unable to enter the market
- A strategic partnership with Dassault Systèmes : the only university in Africa with a digital 3D experience platform, an entire computer-aided design platform
- Ongoing partnership with Huawei for a certification program

Figure: 1337 center profile

1337 Benguerir Khouribga

■ **Selection process :** First an online test of logic and memory in the form of video games. Then a competition "The pool" lasting a month during which the candidates are required to carry out an individual or a group project (group grade is the lowest member's grade); the projects are without guidelines and require a self research.
■ **Selection criteria :** respects the national representativity of regions (except quotas for Benguerir & Khouribga).

■ **Not State accredited** - Training of 3 to 4 years - Automatic correction of exams - Focus on innovation not employability.
■ **No teachers :** peer learning online on websites such as MIT's.
■ **Basic training :** C coding language, and general fields (security, AI, video games…)
■ **Learn how to learn principle :** teaching the way of learning because, given the large number of technologies, it's not possible to teach them all.
■ **Soft skills :** students have access to UM6P's trainings if they want to.

■ **Recruitment job/ internships :** the company accepts the student, who is then given a short period to learn the specific technology required to work there.
■ **Global Network :** as the school is 100% digital & is based on peer-to-peer teaching, students can learn from people all over the world.
■ **Students-Companies :** Over 50 companies already met the students to share their experience, but also to be challenged by the students on their technologies.

■ **Language :** Trainings available in French and English, but over 90% of students prefer English
■ **Entrepreneurship :** 30% of graduates create their startups during their training
■ **Company size :** students used to prefer large groups, now they prefer innovative startups (especially niches)

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Huawei's initiatives

Huawei vision is to "bring digital to every person, home and organization for a fully connected, intelligent world", believing that everyone, everywhere has the right for education and equal opportunities.

Eucation4All is promoting digital inclusion with a focus on three priorities: technology, applications, and skills.

Technology

To Make digital technologies affordable for developing regions with scalable, low-cost products and solutions.

Applications

To create digital ecosystems and help developers build applications for different communities and industries.

Skills

To work with local governments, communities, organizations, and other partners to improve society's digital skillset.

Knowledge and skills are the cornerstone of every progress. ICT promotes equal access to education and serves as the building block to develop nations. In education, Huawei focuses on four types of programs: Skills on wheels, connecting schools, empowering the unempowered, and building a thriving ICT talent ecosystem. Together with its partners, Huawei is committed to providing equal access to high-quality educational opportunities for people of different regions and groups using digital.

Skills on Wheels

Using mobile classrooms that provide digital skills to underserved and remote communities and ensuring that young people know about online safety.

Connecting Schools

Providing access to high quality resources for learning, teacher training, and developing digital courses by connecting every school to the internet.

Projects and Programs

Empowering the unempowered

Equipping underserved communities with the skills and resources they need to enjoy greater opportunities in work and life.

Building a Thriving ICT Ecosystem

Training the students of today for the ICT jobs of tomorrow in partnership with universities across the globe.

a) DigiTruck: Building a Road to Digital Skills

DigiTruck is the latest program under Huawei's TECH4ALL initiative that supports access to high-quality education. It focuses on providing digital skills training for rural teachers, unemployed young people, and women. Huawei's DigiTruck is a shipping container that has been converted into a mobile digital classroom. The 12-meter classroom is equipped with smart devices like laptops, LED screens, virtual reality (VR) headsets, smartphones and routers. Students can use smartphones and laptops to learn Internet skills thanks to wireless broadband access. The entire truck is solar-powered, so classes can be held in remote areas that lack a power supply.

b) Bringing ICT Education and Employment Closer Together

ICT Academy: Bridging gaps for the future

Launched in 2013, Huawei ICT Academy provides training on ICT technologies to university students worldwide and encourages

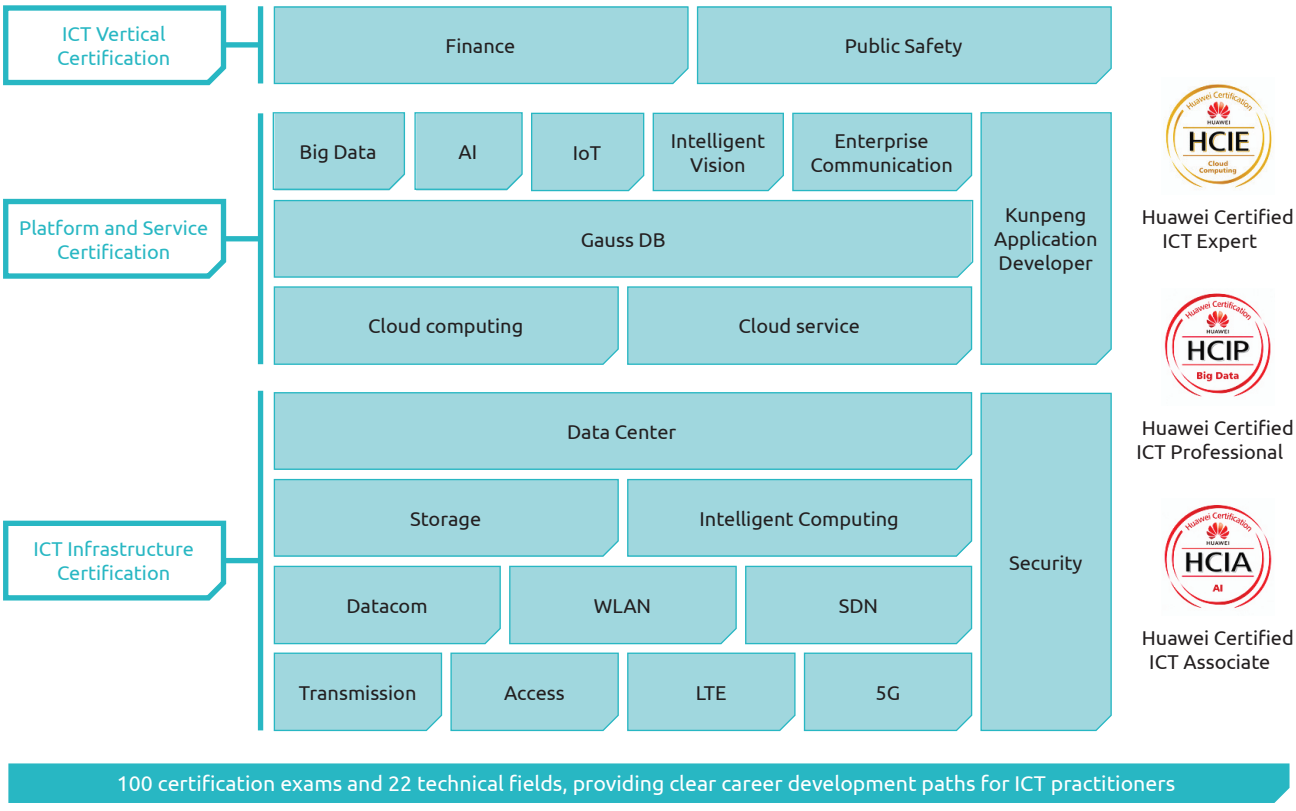
them to participate in certification programs. The academy aims to develop local ICT talent to meet future demand and build a sustainable talent ecosystem. As of December 2019, Huawei had worked with 938 universities in 72 countries and regions to help develop teaching materials, train teachers, build labs, and certify students. In 2019 alone, Huawei trained over 45,000 students.

Huawei also launched the ICT Competition in which university students from around the world can compete and interact, helping them apply what they've learned and seek employment in ICT more easily.

Huawei certification: Developing standards for cultivating talent

Huawei provides a leading talent development system and certification standards. Its certification system consists of ICT Infrastructure Certification, Platform and Service Certification, and ICT Vertical Certification. The firm worked with over 100 global training partners to provide ICT training and talent certification services worldwide. As of 2020, Huawei certification history accumulated 470 502 certification.

Figure: Demonstration of Huawei's talent development system and certification standards



Source : Huawei

c) Learn on Program

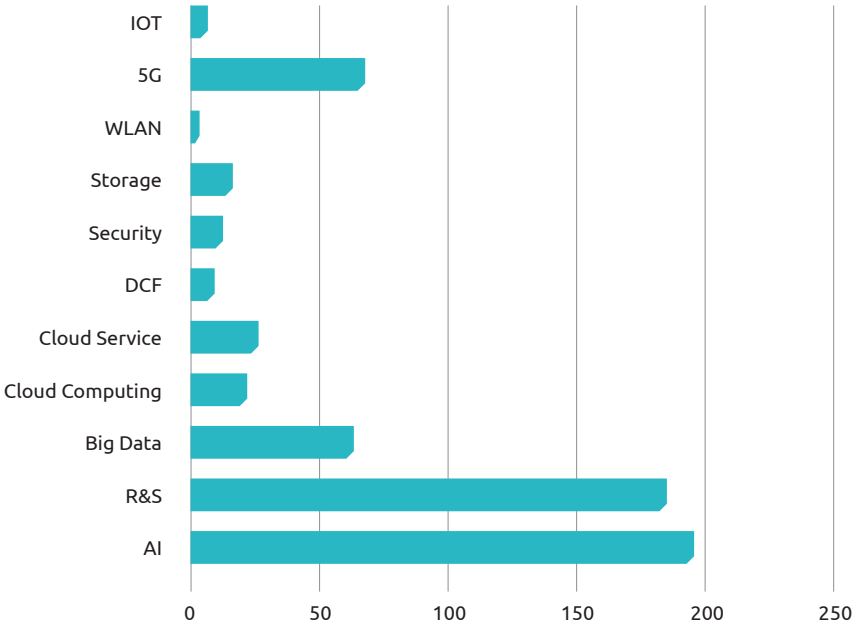
In response to the epidemic Huawei' launched "Learn ON" program around the world, providing high quality resources, builds open platforms, and offers financial support. In addition, it includes numerous initiatives, covering various aspects of learning, including teaching, practice, tutoring and forum, review and content development. The following actions were taken:

1. Huawei ICT Academy Development Incentive Fund (ADIF) allocated for education institutions partners to run online activities such as courses, training, and research projects.
2. More than 130 MOOC resources were opened, covering advanced technical fields such as Artificial Intelligence (AI), big data, 5G, and Internet of Things (IoT).
3. More than 100 online Train the Trainer (TTT) will be provided from April to December, and more than 1500 teachers are expected to be trained.
4. 50,000 students are expected to be trained through online self-learning, courses, and classes.

d) Morocco Study Case

The smart education program was launched in Morocco through a strategic partnership between Huawei Morocco and the Ministry of National Education, Vocational Training, Higher Education and Scientific Research, with the aim of equipping students with ICT skills and thus promote their integration into the job market.

Figure: Certified moroccan students in 2020



Under the terms of the MoU, the cooperation between the Ministry and Huawei Technologies-Morocco will be based on the following four main axes:

- The launch of the "Huawei Academy Morocco" program in Moroccan universities which consists in providing training and certification programs by Huawei to students and teacher-researchers;
- The awarding of the "Huawei Seeds for the Future" excellence prize to the most deserving students from Moroccan universities in the fields of networks and telecommunications;
- Opening to Moroccan students the opportunity to compete in the "Huawei ICT Competition";
- The organization of seminars and workshops to exchange expertise and experiences in the integration of information and communication technologies in education.

In Morocco, Huawei has so far signed partnership agreements with 21 universities and higher education institutions. In 2020, to meet the challenges of Covid-19, Huawei ICT Academy launched the "Learn ON" initiative by setting up online courses for students. In Morocco, more than 3000 students have been able to pursue their studies at a distance thanks to this initiative. In addition, nearly 500 students have received Huawei professional technical certifications in 5G, AI and Big Data. Moreover, Moroccan students benefiting from this program are the only ones on the continental scale to be certified in 5G.

A PHOTOGRAPHY OF MOROCCO'S DIGITAL SKILLS: FINDINGS FROM THE SURVEY

1. Methodology

NFor this project, a dual approach was chosen, combining quantitative and qualitative aspects. The main idea behind this dual approach was to reduce biases and to be able to have a strong scientific base.

On the qualitative level, 30 extensive individual interviews were conducted, with stakeholders from the ICT ecosystem, including key representative of ministries, government agencies, academic centers, digital experts & entrepreneurs, and other key actors. Each interview lasted between 1 and 2 hours, following an interview guide allowing respondents to follow a specific path.

On the quantitative level key data and insights from 3 specific targets covering both the ICT offer and demand were collected, which enabled us to identify potential gaps, through advanced data analysis. The three scanned communities are as follow:

1. Chief Human Resources Officers (CHRO) & ICT managers: 60 CHROs & ICT managers answered a questionnaire both online & via phone for 20 to 30 minutes, including a wide range of industries and domains: telecommunication, IT, banking & finance, consulting & client services, industry, media & audio-visual, e-commerce, etc.

2. ICT Students: 520 students answered an online questionnaire online via a dynamic sampling method (average time: 15 minutes). It included both public and private establishments, as well as graduates who are still looking for a job, and a good representation in terms of genders, ages, cities, degrees and ICT domains

3. ICT workforce: 135 employees from a wide range of organizations answered an online questionnaire via a dynamic sampling method (average time: 15 minutes). It included includes full time and part time employees, as well as freelancers and entrepreneurs.

All numbers in this section are based on quantitative and qualitative tools mentioned above. Sample size and detailed targets are available in the appendix.

Limitations of this study

However, Morocco needs to multiply large scale studies and monitoring systems that would allow both the education system and the private system to adapt better to the evolutions of the digital world.

Surveys such as this one need to be done at least on a yearly basis, with changes in the sample and regional focus in order to address territorial specificities.

Finally, sectors that are not directly ICT related need to be polled and analyzed to assess their potential for digital transformation and skills enhancements.

2. Level of awareness

Most interviewees were knowledgeable about digital skills and the evolution of the digital sector. According to the first results of our survey, the ICT market in Morocco is growing steadily and is projected to follow an accelerated pace. Yet, there is room for further increase, especially after the COVID-19 digital disruption.

According to the respondents, 86% of the needs in ICT profiles will increase in the next 5 years. Moreover, 67% of these CHRO's and ICT managers affirm they are planning on filling new ICT positions this upcoming year.

During the COVID-19 crisis, the ICT sector is claimed to have performed well, and it has demonstrated strategic agility. The sector was an essential player to help other businesses for quick ability to respond to new constraints and develop new business models. Most ICT employees could work remotely. However, adapted regulations and additional processes need to be implemented. Most ICT employees were able to keep their jobs, and companies kept investing and recruiting which shows resilience.

The industries which have performed well during the crisis were: education, health, e-commerce, Agritech and mobile payment / Fintech. However, according to our respondents, one of the most important insight is that it's not only about skills but about a change of civilization and a paradigm shift affecting the education system, the way of working and even the role of public institutions and governments. Hence, digital culture touches every aspect of society and this change can't wait because it's either driven or incurred.

In the face of the disruptive nature of technology, the new model should be disruptive by itself. People are as well worried that Morocco won't be able to undertake the necessary cultural change, summarized by a striking comment of one of the interviewees: "If we change everything and go fully digital, we will still have people and institutions entrenched in the XXth century".

This reflects a general form of pessimism, and therefore, most public leaders, although very enthusiastic about new digital policies are very cautious when it comes to execution and broad reforms.

Young generations, among which 39% of those already on in the job market and 50% of students, express a negative outlook and pessimistic views of the job market which materializes in an average turnover of 2 years according to

CHROs and ICT managers.

Aspiration towards entrepreneurship seems high, 32% of the workforce and 16% of students aspire to create their own businesses, but only 2% manage to do it. Freelancing represents an alternative path to introduce students to the professional world, 29% of them had already done it but only 8% want to do it in the future. For the workforce, freelancing is seen mostly as an alternative to unemployment 42% have already done it and 14% would like to do it.

Many reasons could explain the gap between the will to go for entrepreneurship and the actual entrepreneurs. According to our interviews, the educational environment does not encourage entrepreneurship. The current academic program focuses only on topics related to ICT majors as one of the interviewees expressed "What we see is that ICT profiles are too much centered on their technology and think they are smart. The problem is that an entrepreneur needs to have business sense, the ability to sell the product and motivate teams ".

There are certainly other reasons than the education system linked mainly to the economic and financial environment. In its 2019 opening of the parliament speech, King Mohammed VI announced a plan to develop a special program to provide financial support to young graduates and fund small self-employment projects noting "the difficulty young entrepreneurs have in obtaining loans, and by the limited financial support provided to graduates and for the creation of small and medium sized enterprises". He therefore asked banks to « to play a greater social role in promoting development, especially by simplifying and facilitating access to loans, by being more open to self-employment projects and by financing the creation of small and medium-sized enterprises»[69].

3. Main challenges

Without any doubt, there is a strong regional concentration of talents and training, creating a de facto "Moroccan ICT Desert" in the rest of the country. In fact, the market demand is concentrated mainly around Casablanca and Rabat, which forces the students from the South, North & Oriental regions to relocate.

From the online survey targeted to ICT students, we see that 40% of students are from the South, North/Center North, Oriental regions versus only 20% of workers who are from the same regions. This means that students are forced to move to the other regions in order to find a job. Efforts have been made for more decentralization.

For example, on the education supply side, we can witness a movement where many "best in class" education establishments are being implemented across the country (e.g. UM6P, Euromed).

The ICT market is affected by key structural problems mainly limited digital inclusion, lack of information, absence of a dedicated ecosystem and a clear vision. Regulatory constraints and complications and insufficient talent pool are perceived as the biggest obstacle to any development.

As one of the stakeholders interviewed said "Procedures are problematic, everything is slow. The regulations are complicated. It's a whole, we must be able to reduce work regulations. Our approach has always been vertical in Morocco"

Although the government launched multiple initiatives, public decision-makers face significant constraints: high cost of hardware, limited access to rural regions and, overcrowded classes. They also face long and complicated budget validation processes implemented by regulatory authorities. In the continuously moving ICT sector, this is even more problematic to quickly adapt and find solutions. In this context, the public sector needs private partners and NGOs and volunteers, who are more agile and can quickly secure funds.

However, international institutions like the World Bank recognize the efforts of the Kingdom. Morocco adopted a strategy to improve its business climate and set the target of taking the 50th place in the Doing Business ranking by facilitating investments. The King has on multiple occasions urged the executives to ensure that conditions are facilitated for launching business in the country. This strategy has given good results since the ranking in Doing Business report 2020 jumped 7 spots to take the 53rd place amid 190 countries. According to the report, Morocco is the country offering the best business climate in North Africa ahead of Tunisia (78th), Egypt, Mauritania and Libya. Several aspects of the index are particularly relevant in terms of preconditions for Fourth Industrial Revolution technologies like ease of starting a business, getting electricity and getting credit[70].

Morocco also stood out in terms of paying taxes. It has scored 87.2 over 100 compared to 75.1 for MENA regional average and 84.7 for Spain. The main reform influencing this index was making taxes less costly by reducing the corporate income tax rate. In 9 years, Morocco saw a remarkable 101-place increase in the paying taxes indicator, following the digitization of revenue collection and alignment of local tax rates to international standards.

Other key reforms were highlighted in the report like protecting minority investors and making trade across borders faster by introducing e-payment of port fees, streamlining paperless customs clearance, extending port hours of operation, enforcing contracts by introducing an automated system that randomly assigns cases to judges and by publishing court measurement performance reports. The report of Doing Business comparing business regulation in 190 economies stated that economies that have adopted electronic means of compliance with regulatory requirements— such as obtaining licenses and paying taxes—experience a lower incidence of bribery[71].

Oxford Business Group stated that the increase is mostly attributed to wider adoption of digital solutions in the country's public sector. The report, however, underlines the need for greater education and training in order for the country to reach the full potential of the new technology in place[72].

Challenges are still ahead, the World Economic Forum ranked Morocco 75th out of 141st in the Global Competitiveness Index 4.0 2019 and 97th in the sub-index

of ICT adoption. The sixth pillar of the index is about skills where it was ranked 111th scoring poorly mainly because the two sub-indexes current workforce (years of schooling) where it ranked 124th and skills of future workforce, which performed better than the previous year but is still 109th[73].

Compared to other countries in the Maghreb, Morocco is ranked first. Tunisia (87th) and Algeria (89th) are second and third respectively, Libya was not included in the ranking and Mauritania is 134th[74]. In Africa, Morocco is ranked 3rd behind Mauritius 52nd and South Africa 60th. In the Arab World, the Kingdom is ranked 8th behind the United Arab Emirates 25th, Qatar 29th, Saudi Arabia 36th, Bahrain 45th, Kuwait 46th, Oman 53rd and Jordan 70th in the world[75].

4. ICT Skills: the new brain drain?

Morocco has had a long tradition of exporting talents when it comes to engineers, doctors and nurses. In 2018, 8000 managers and technicians, 1200 entrepreneurs, 600 engineers and 630 doctors left the country. In 2017, 25% of managers in the ICT sector left for opportunities overseas[76].

It's such a national concern that King Mohammed VI said in his speech on 65th Anniversary of the Revolution of the King and the People: "Many young people, especially those with advanced university degrees, are considering leaving the country, not just because of attractive incentives abroad, but also because they do not find the right environment and conditions at home for employment, career advancement, creativity and scientific research. Generally, the same reasons discourage a number of Moroccan students abroad from coming back home to work once they finish their studies[77]. "

The problem has been accelerating under the double pressure of globalization, especially because the ICT sector knows no boundaries. Therefore, the most striking number of the study is that 74% of students want to leave Morocco in the short/medium term. Counter intuitively, the brain drain is motivated by the lack of perspectives rather than monetary considerations and is coupled by an international talent war in the ICT sector, especially in Europe and the United States.

This represents a key frustration among the recruiters who often train talents who end up leaving. Key verbatims collected are: "More Moroccan talents leave the country. They used to leave for education. Now, married people with children and many years of experience are leaving Morocco too"; "4 or 5 years ago, the whole class of ENSIAS computer engineers, 25 graduates left to Germany".

However, this trend should be put in perspective of an international trend of employees moving abroad. The Boston Consulting Group study "decoding global talents 2018" revealed that 90% of Indians and 70% of Brazilians would be willing to move to another country for the job. The United States, Germany and Canada are, respectively, the most popular work destinations. China's workforce is significantly less inclined to consider a foreign work assignment. From the digital-development jobs perspective, 67% of global respondents who are experts in areas like user interface design, mobile app development, and artificial intelligence or machine learning say they would be willing to move to a new country for the right job, 10% above the global average[78].

5. Gap layers: language, maturity, soft skills

The Moroccan education system is perceived to teach students how to process a high quantity of information and advanced analytical skills. In terms of hard skills, most recruiters agree that graduates have a satisfying level of hard skills in the ICT domains and that they have a high ability to learn new concepts quickly. Data science and analytics is considered the most emerging hard skill by 47% of CHRO's. Students get trained on tools which are not necessarily relevant in the corporate world. 66% of the workforce uses frequently ERP software tools while only 9% of the students use them. However, on many advanced and emerging ICT technologies, graduates need training and have lack proactivity.

Still, 71% of CHRO's and ICT managers find it difficult to find relevant ICT profiles and 45% complain about the lack of soft skills. Companies complain that many ICT graduates don't have the maturity level needed to work in companies. Recruiters are mainly looking for honesty, respect, discipline, courage, rigor and passion. Recruiters are mainly looking for project management, business sense, group work, communication, leadership, critical thinking, creativity and, self-confidence.

The growing need of soft skills is an international challenge as well. "Decoding Global Talent 2018" report by Boston Consulting Group about workforce changes and skills of the future identified two possible reactions of the 61% of the respondents who believe that their current positions will be greatly affected by technology changes and globalization. Upskilling which refers to willingness to adopt new skills for current positions and reskilling which refers to pick up new skills for a completely different job. To excel in the future, people believe, they should master a mix of cognitive and interpersonal skills so that they can think analytically as well as communicate and collaborate with supervisors and coworkers. When they need training on new skills, they prefer to learn on the job, on their own, and through online classes and mobile apps to other more traditional options[79].

Language is an important issue. A growing number of ICT students and professionals prefer English and don't speak enough French. However, most Moroccan companies communicate in French, including Information technology outsourcing providers of French clients. Overall, the level of proficiency in both languages still need to be enhanced.

The Kingdom gained independence in 1956 from France and shortly afterward regained most of the territories under Spanish control. Since then, Language persisted in political debates as a national identity topic. All educations reforms since the 80`s were surrounded by debates about which topics to be instructed in which language. The most recent polemic was in 2019 when the parliament approved a draft law to teach scientific and technical subjects in French. For a young Moroccan student, choosing between French and English is more about choosing which foreign

culture he or she feels closer to rather than jobs needs.

6. Education and training

Despite a perceived lack of soft skills, companies prefer to hire graduates from public schools and universities preferably with certifications. On one hand, 53% of CHRO's and ICT managers find that public institutions focus more on technical skills, 36% find them stricter and more performing and 34% that they have more competent teachers. On the other hand, private institutions are perceived to provide better business understanding according to 68% of this group respondents and 62% declared that they focus more on soft skills and ultimately that they have more funds. The good news is that graduates demonstrate a mindset towards continuous learning. 60% of them declare professional certifications as a source of leaning ICT, 52% said it is workplace learning and 49% self-training. Since ICT technologies evolve rapidly and continuously, students need to "Learn how to learn" through different projects and practices in real-life situations, whereas the current system is based on academic courses. The current education system doesn't allow the "Alternance" (apprenticeship) and the "VAE" (validation of acquired experience) system, so students are struggling to have substantial corporate experience before graduation.

The academic institutions are blocked in a paradigm that leaves many high potentials out of the system due to the selection criteria based on grades instead of ICT related skills and passion.

The school-to-work transition is a major issue, the numbers we found in the study talk for themselves. 42% of students interviewed had none or only one internship during their curriculum. As one respondent declared ""The fundamental difference between Morocco & abroad is at the level of internship experiences. In Morocco, the experience of the graduate in terms of internships must be concrete so that the person brings added value upon leaving school. Abroad, interns are empowered and deal with real topics". Academic establishments programs fail to integrate students into the corporate world, only 22% of students benefited of support by their university to find internship or work. The concept of alumni network is not developed only 9% of students found internships in CT through their alumni network, while 55% found it through LinkedIn and 43% through friends and acquaintances. Hiring seems more direct though hackathons (77%) and firm's website (55%) comparing to 11% through alumni network and 5% through job fairs. On the company's side, 27% recruit through specialized agencies and 23% through academic establishments. Like students, CHRO's and ICT managers use primarily social media (39%) as a source for recruiting best ICT candidates.

Misalignment of academic training with the market needs is a recurrent issue. This is mainly due to a lack of co-working strategy between the educational institutes and recruiters and lack of orientation resulting in a lack of awareness concerning the skills needed for each education path to match market opportunities.

Once graduates integrate the corporate world, they face new challenges due to the continuous and rapid evolution of technology. 38% of companies do not offer any program or training in ICT. For the ones who offer training, the frequency is most of the time very low: 9% less than once a year, 47% every 6 to 12 months. Therefore, workforce opts for system D as the main tool for solving ICT challenges, the main one is YouTube tutorials according to 70% of the workforce.

When they offer training programs, companies, 53% of them develop inhouse training & upgrading skills in-house, and 43% have partnerships with ICT vendors to support employees in ICT training. They are perceived as attractive retention tools by the companies. 87% of the Workforce affirms having intentions to develop ICT skills with the latest professional certifications available.

Although considered as theoretical education only and not affordable for all, specialized technology-related certifications are considered to guarantee a level of proficiency in the defined expertise area. Nevertheless, they are not perceived to be critical decision-making criteria of selection for ICT profiles in Morocco. CISCO, IBM & Huawei remain the top certification providers currently used. Huawei certifications awareness is specifically higher among academic establishments, especially those who have a partnership with Huawei Academy, it is higher among both graduate and work force respectively, 65% and 63%.

However, youth who grew up in and by this model are not waiting for changes to come from the other components of the society. Public institutions must create the conditions within to innovate. Beyond education reform, diplomas must be revisited into something not permanent and School-to-work transition must be open and flexible. This has direct implications for economic development, during the roundtables we organized, public decision-makers confirmed that investors from all sectors ask them about digital skills supply. In this sense, the digital skills gap affects not only digital sectors but all investment decisions. Finally, the digital skills gap should become a strategic priority due to the demographic situation in Morocco and the number of youth in the market.

7. Why great career pathway always Start with Fully Aligned Competencies?

As emerging Digital Technologies such as Artificial Intelligent (AI) – Data Sciences field itself continue grows pace in the MENA region including Morocco, the need for Artificial Intelligent (AI) Digital Talent Professionals will increase in tandem with the digital economic growth. As Artificial Intelligent (AI) job market's demand increases within the next 2-5 years in two major areas especially in "AI-Based Data Sciences" and "AI-Based Robotic Process Automation (RPA)", so will the interest for Moroccan youth, working professionals, and university graduates in pursuing Artificial Intelligent (AI) training programs and certification.

Although "AI-Based Data Sciences" as a field has existed for several decades, the rapid growth of Artificial Intelligence (AI) in business in the last few years has generated a demand for key job roles such as Data Scientist, Data

Analyst, Machine Learning Engineer, Software Engineer-ML, Machine Learning Researcher, that far surpasses the availability of the trained Digital Talent professionals. Today, 41% of the executives from digitized organizations cite a lack of AI trained Digital Talent professionals remain the biggest challenge across global business.

This Digital Talent gap provide an opportunity for aspiring Moroccan's working professionals, graduates, and youth, and a challenge for companies striving for a competitive advantage in the MENA market. For prospective where Moroccan organization are building a pool of talent in data sciences, gaining the necessary skillset and competency knowledge required can be a formidable challenge. In this whitepaper we cover the "Foundation of Data Science Skills Competency Framework" to help Morocco Policy Makers, Academy Institutions, Hiring Job Agencies, Graduates, Youth, and organization resource talent development HR Team for recruitment, skills development, and job-career path mapping.

The "Foundation of Data Science Skills Competency Framework" are organized into seven-generic key areas, combining with foundation skillset in the typical Organization "AI-Based Data Sciences" field workflow

Foundation of 'Data Science Skills Competency Framework' (Preview)

	Key Domains	Generic Skillset and Knowledge Competency
1	Data Sciences Foundation	■ Demonstrate general understanding data science concepts; ■ Demonstrate use of methodologies in the execution of the analysis cycle;
2	Statistic and Programming Foundation	■ Knowledge on sampling, probability theory, and probability distribution; ■ Knowledge on descriptive statistical concept; ■ Demonstrate Knowledge of inferential Python programming Skills; ■ Implement descriptive and inferential statistics using Python; ■ Demonstrate ability to visualize data and extract insights; ■ Address project with the ability to analyze a dataset and insights;
3	Data Preparation	■ Ability to collect and identify data from multiple format; ■ Ability to manipulate, transform, and clean data; ■ Highlight expertise with techniques to deal with missing value, outliers, unbalance data, and data normalization; ■ Address project with the ability to construct usable data sets;
4	Model Building	■ Ability to understand of Linear Algebra, principles of Machine Learning; ■ Knowledge of different modelling techniques; ■ Knowledge of model validation, and selection techniques; ■ Ability to communicate results translating insights into business value; ■ Address project with the ability to test different models on a dataset, validate and select the best model, and communicate insight results;
5	Model Deployment	■ Ability to deploy and monitor a validated model in an operational environment; ■ Highlight through a project the ability to deploy and use a deployed model;
6	Big Data Fundamentals	■ Knowledge of big data platform (Hadoop/Spark); ■ Understand Big data ecosystem;
7	Leadership and Professional Development	■ Ability to articulate data insights, trends, value to the organization; ■ Ability to transfer data science knowledge through teaching and mentoring;

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THE DIGITAL SKILLS MATRIX : A PLATFORM FOR DECISION MAKERS

The emergence of a vast new digital world is changing the structure of the labor market in many ways disrupting the balance between supply and demand for digital jobs. It is also raising sharp questions about the match between the training offer from academic institutions and the real needs coming from the job market.

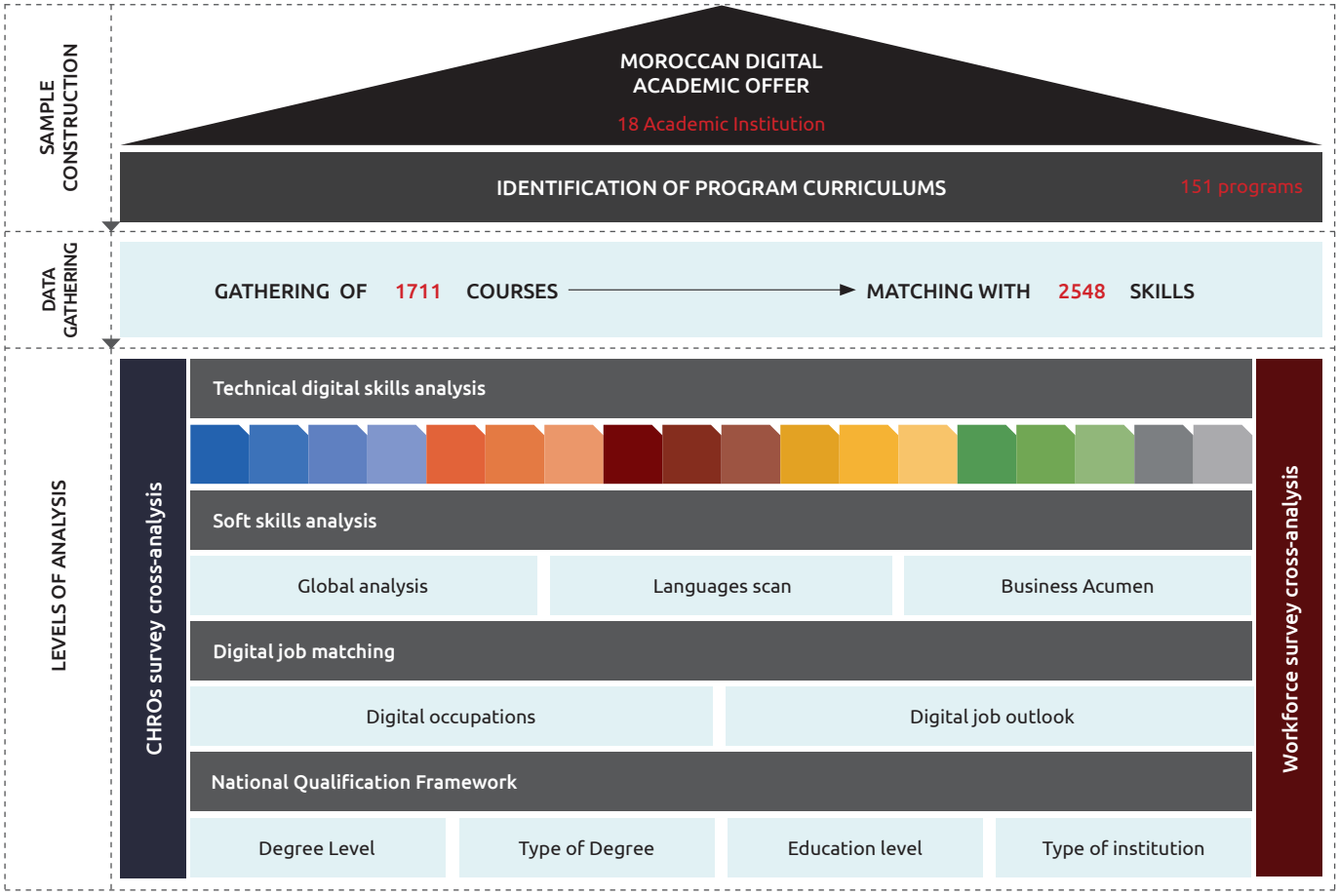
These are key points we need to address in order to analyze to what extent we meet or not the market needs and to help refine, as precisely as possible, the future national offer in terms of ICT training and certifications. In order to assess this potential gap, the Digital Talent Review team developed the "Digital Skills Matrix", a platform that allowed us to expose the present digital skills set landscape in Morocco and compare the digital skills gap between the industry needs, embodied by the workforce and human resources leaders, and the academic offer. Confronting both results from the survey and the matrix has led us to gather striking examples of misalignment between these three stakeholders in terms of market perception and reality.

This demonstration also helped us assess the alignment of our three stakeholders - recruiters, digital talents and academic institutions - regarding critical issues such as knowing what kind of Digital skills to equip in the current and future pipeline to allow graduates, working professionals, and unemployed to meet the demand from the Industry.

1. Methodology

To that effect, 155 programs identified in 18 academic institutions allowed us to analyze more than 1711 digital-related courses which were confronted with the demand's 18 technical digital skill domains needs coming from the survey. In addition, the Digital Skills Matrix tool was also used to analyze the soft skills related courses taught in the 155 mentioned programs.

Figure: Digital Skills Matrix data gathering and analysis' methodological approach

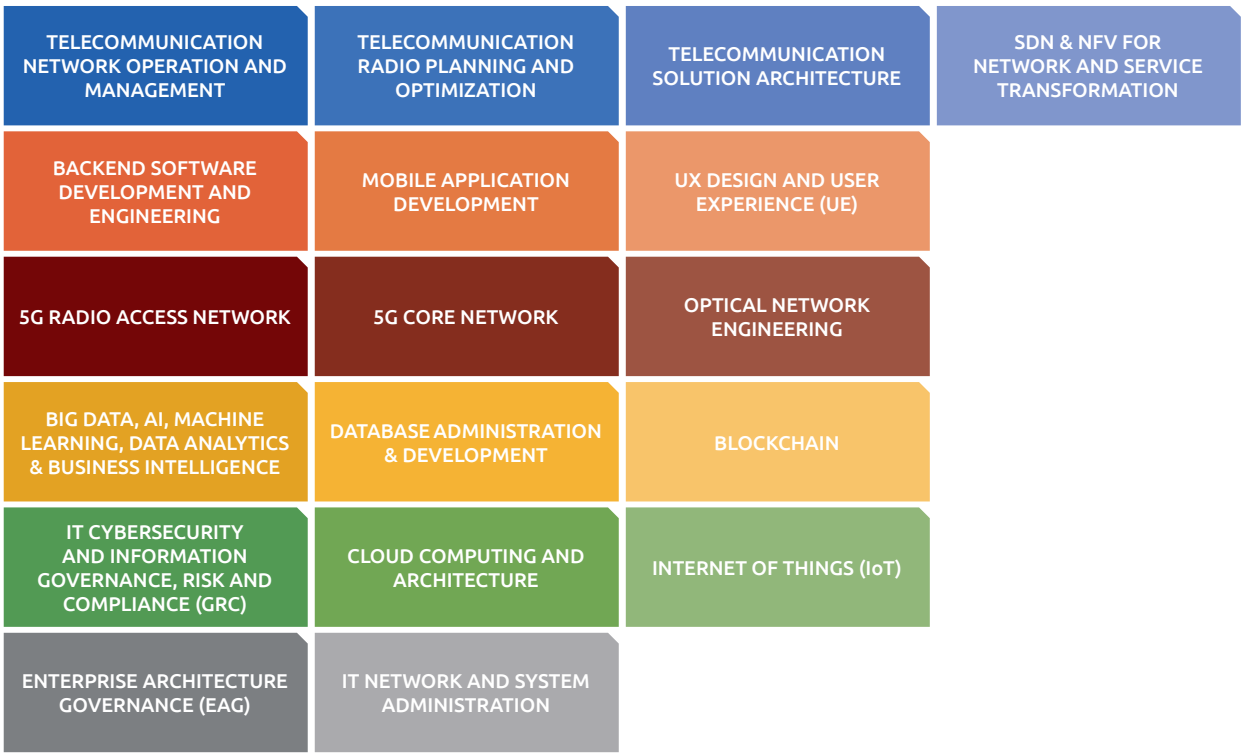


That way, the analyzed digital skills refer to all the technical knowledge and qualification that can be learned, proven and demonstrated through education and expanded during internships, apprenticeships or throughout a professional career. The digital technical skills portfolio includes the first and foremost competencies that will help determine someone's area of expertise and specialization. To be successful in the ICT industry, the technical know-how required will vary from a job position to another. Digital technical skills set can include Software development, Networking, Data Analytics, Machine Learning, Cyber-security and many more.

In addition to the cross-analysis between the survey and the matrix results, each domain job family related to the 18 technical digital skills was highlighted with its critical skill set requirements, along with its compatible digital job roles, ending with the "Industry Job Outlook" within Morocco and the region.

The chart below shows the technical digital skill domains used in the Digital Skills Matrix. That way, each of the courses were matched with at least one of the following domains.

Figure: Critical Technical Digital Skills Domains used in the Digital Skills Matrix



2. Moroccan Digital Skills' Landscape

Our 18 technical digital skill domains' definitions and related compatible job roles are listed below.

Telecommunication Network Operation and Management

- Network Solution Delivery Engineer
- System Integration Engineer (Infra & Devops)
- Network Operation Center Engineer
- Network Management Engineer
- Network Architecture and Planning Engineer
- Network Administrator

Telecommunication Network Operation and Management skills provides end-to-end tools to assess and maintain the telecommunication network performance. It includes competencies in all networking aspect including IP, VPNs, Routers, Switches, as well as in depth knowledge of Organization Network Infrastructure Technologies.

Telecommunication Radio Planning and Optimization

- Wireless Engineer
- Radio Frequency (RF) Designer
- Radio Frequency (RF) Architect
- Radio Frequency (RF) Architect
- Radio Frequency (RF) System Integrator
- Radio Frequency (RF) Design Engineer

Telecommunication Radio Planning and Optimization skills are essentially used for engineering, planning, monitoring and optimization of Radio Radio Frequency, Propagation models and Universal Mobile Telecommunications Systems.

Telecommunication Solution Architecture

- Network Architect
- Network Architecture and Planning Engineer
- Solution Architect (Mobile and Core)
- Radio Frequency (RF) Architect

Telecommunication Solution Architecture skills treat and execute the data and voice telecommunications roadmap in support of the Industry standards. It also enables to manage Mobile Network Service Control Layer and include a deep knowledge of mobile and telecommunication components.

SDN & NFV for Network and Service Transformation

- SDN NFV Architect
- SDN NFV Engineer
- Cloud Networking Engineer

Software-defined networking (SDN) and network functions virtualization (NFV) for Network and Service Transformation Skills enable physical networking resources and infrastructures to be abstracted and implemented into softwares through virtualization.

Backend Software Development and Engineering

- Software Engineer
- Team Lead Developer
- Software Architect
- Backend Developer

Backend Software Development and Engineering domain gathers skills enabling to curate the structure of a server's side information, write server scripts to be utilized by front office, improve the server, server-side applications, and databases that upgrade back-end processes and codes, when combined with front-end codes, help create a functional, seamless experience for the end-user

Mobile Application Development

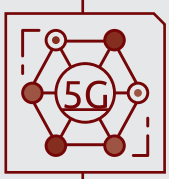
- Java Application Developer
- Mobile Application Developer
- Mobile Software Engineer
- Lead Java Developer
- Javascript Jquery Developer
- Web Developer

Mobile application development is related to the creation of software applications or small, wireless computing devices, using traditional software development. Mobile application also involves implementing backend services, testing the application on targeted devices and creating installable software bundles.

UX Design and User Experience (UE)

- Web (Front End) Developer
- User Interface (UI) Designer
- User Experience (UX) Designer

UX and UE design is the process of designing usable and useful products that provide meaningful and relevant experiences to users. This involves the design of complete processes aimed to acquire and integrate the product, including aspects of branding, design, usability and function



5G Radio Access Network

- 5G RAN Solution Architect
- 5G RAN Engineer
- 5G Wireless QA Engineer
- Radio Optimization & Capacity Enginee

RAN Engineering includes support and maintain network elements, perform network analysis for troubleshooting, and create to execute test case and organizing field trials of a network. 5G RAN engineer focuses on technologies such as 5G networking, with offer support for LTE and small cell projects, and they are well versus in protocols like VoLTE and ViLTE.

Optical Network Engineering

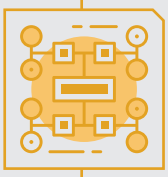
- Optical Network Engineer
- Network Engineer - Optical Networking
- Optical/Transport Engineer
- Optical DWDM Engineer

Optical Network Engineering processes use signals encoded in light in order to transmit information in several types of telecommunications networks. It involves the planning, design, implementation and/or maintenance of an optical network.

5G Core Network

- Core Network Service Assurance Engineer
- Core Network Engineer
Product Manager

i5G Core is a new architecture and network paradigm that shall be deployed in the service provider's network. 5G Core Network is for NR stand-alone deployments and interworking with Evolved Packet Core will remain important to maintain service continuity.



Big Data

- Data Analyst
- Data Engineer
- Data Architect
- Data Scientist
- Business Intelligence Engineer

Big Data includes skills are related to the field of Big Data, Artificial Intelligence, Machine learning, Data analytics and Business Intelligence. This field treat complex data and may include a mastery in Programming Languages such as Python, Java, C++...

Database Administration & Development

- Database Administrator
- Database Developer

Database Administration & Development skills are used to manage and ensure the availability of a database. It also include monitoring and optimizing of the database's performance using software such as SQL, Oracle-based system, and Industry lead open sources RDBMS.

Blockchain

- Blockchain Developer
- Blockchain Architect
- Blockchain Engineer

Blockchain skills are critically important to globally store data on thousands servers in a way that makes it difficult or impossible to hack, mainly by using Cryptography algorithms and methods.

IT Cybersecurity and Information Governance, Risk and Compliance (GRC)

- Cyber Security Analyst
- Information Security Consultant
- Cyber Intelligence Analyse
- Network Security Engineer
- Information Security Auditor

GRC skills are directly related to cybersecurity, risk management and compliance. It can be defined as a combination of processes established to address uncertainty using regulatory standards (ISMS, GPIS), and network security monitoring.

Cloud Computing and Architecture

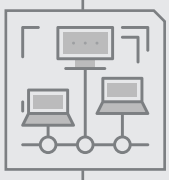
- Cloud Developer
- Cloud Architect
- Cloud Engineer

Cloud Computing and Architecture skills refers to the ability to adopts Cloud Migration and Deployment within Multi-Cloud Environments, understand serverless architecture, knowing the migration/multi-cloud deployment strategy, Devops engineering capabilities, and cloud-data security.

Internet of Things (IoT)

- IoT Embedded System Designer
- IoT Developer
- IoT Architect
- IoT Solution Engineer

IoT skills are essential to address physical devices embedded with software and other technologies that needs to be connected to the internet, share and exchange data with other objects and systems.



Enterprise Architecture Governance (EAG)

- IT Change Manager
- Chief Technology Officer
- Chief Information Officer
- IT Project Manager
- IT Operation Manager
- Service Desk Manager

Enterprise Architecture Governance (EAG) involves the enablement of effective IT and digital procedures aiming at the promotion of an enterprise's strategies and leadership objectives, providing a complete knowledge of organizational structure.

IT Network and system administration

- Network Administrator
- Network Designer
- Network Architect
- Network Maintenance Specialist

IT Network and system administration consists of organizing, installing, and supporting an organization's computer systems, including local and wide area networks, intranets, network segments, and other various communication systems.

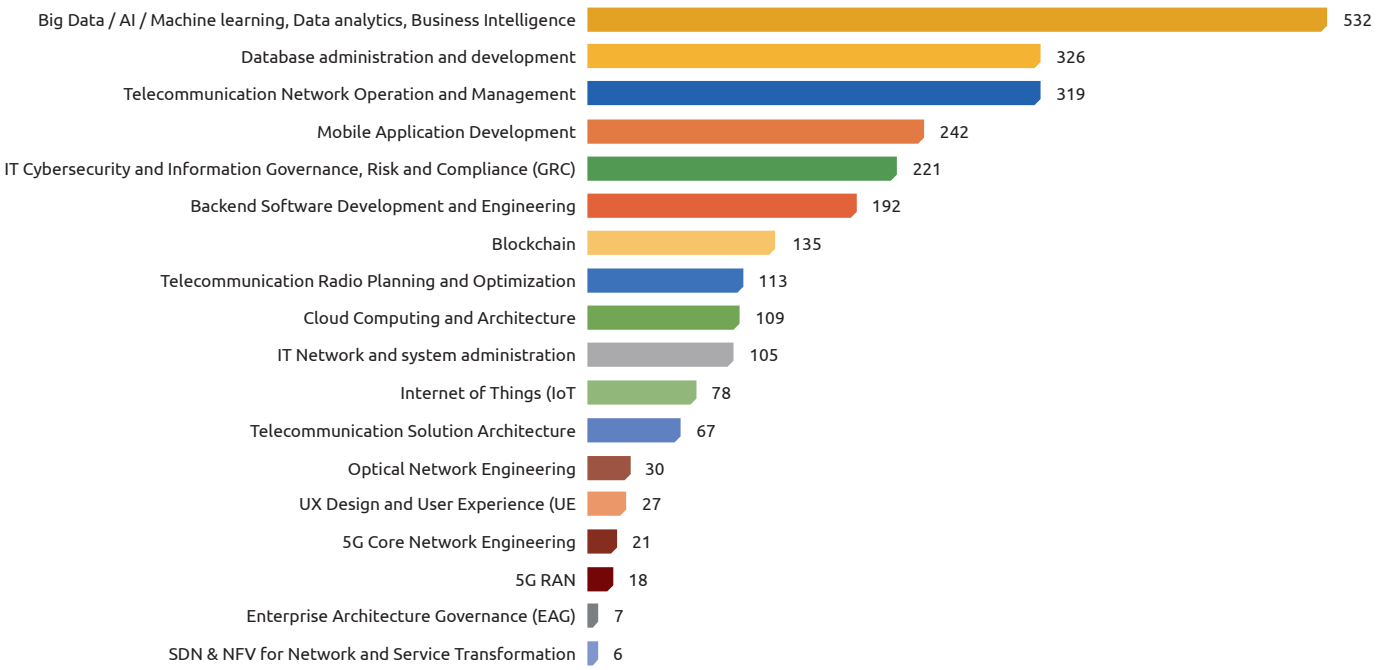
3. Digital Offer vs. Demand : Exposing the Gap

The skills matrix analysis showed substantial disparities between technical digital skills coverage rates by the academic institutions. Thus, on the 18 technical digital skills analyzed, 4 of them concentrate more than 50% of the academic sector's digital offer. That way, Big Data related skills (Machine Learning, Data Modelling, Data Analytics, and Data Mining & Visualization) alone represent 21% of the offer, appearing 532 times on the 1711 analyzed course. Database administration skills and "Telecommunication Network Operation and Management" skills appear respectively 326 (13%) and 319 (13%) times in the analyzed program

Figure 4: Technical Digital Skills Ranking arranged in decreasing order

Rank	Digital Technical Skills Domains Ranking	#	%
1	Big Data, AI, Machine learning, Data analytics, Business Intelligence	532	20,9%
2	Database administration and development	326	12,8%
3	Telecommunication Network Operation and Management	319	12,5%
4	Mobile Application Development	242	9,5%
5	IT Cybersecurity and Information Governance, Risk and Compliance (GRC)	221	8,7%
6	Backend Software Development and Engineering	192	7,5%
7	Blockchain	135	5,3%
8	Telecommunication Radio Planning and Optimization	113	4,4%
9	Cloud Computing and Architecture	109	4,3%
10	IT Network and system administration	105	4,1%
11	Internet of Things (IoT)	78	3,1%
12	Telecommunication Solution Architecture	67	2,6%
13	Optical Network Engineering	30	1,2%
14	UX Design and User Experience (UE)	27	1,1%
15	5G Core Network Engineering	21	0,8%
16	5G RAN	18	0,7%
17	Enterprise Architecture Governance (EAG)	7	0,3%
18	SDN & NFV for Network and Service Transformation	6	0,2%
TOTAL		2548	100%

Figure 5: Critical Technical Digital Skills Distribution



Source : Guepard Group - Digital Skills Matrix - DTR 2020

curriculums. Finally, Mobile Application Development skills are taught in 242 of the courses, which corresponds to 9% of the total.

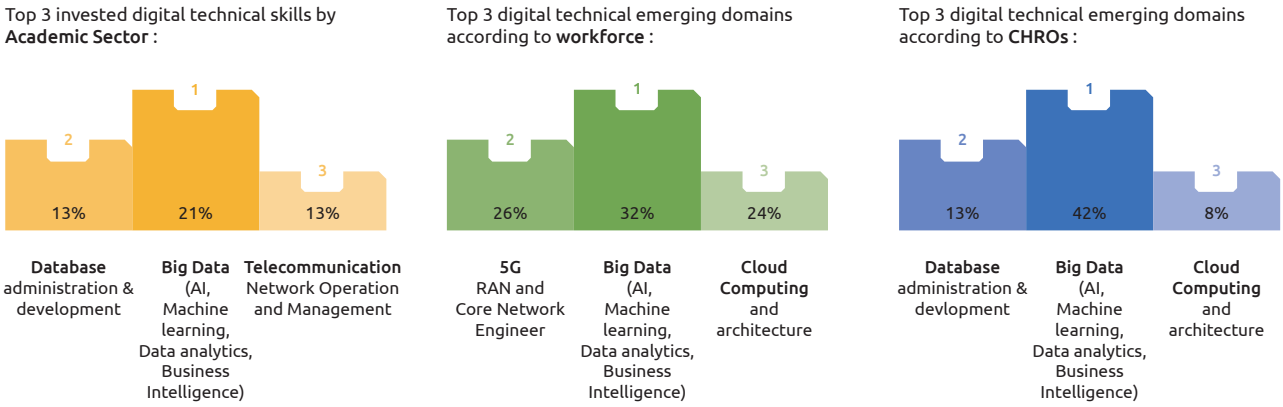
While these 4 digital technical skills largely dominate the academic teaching and curriculums offer, the remaining skills rates contrast with these 4 mentioned skills. As a reference, Optical Network Engineering related skills appear in only 30 courses and EAG only 7 times, depicting an unbalanced academic offer in terms of digital technical skills.

Whereas it is not unusual that skill gaps appear in the academic landscape, the results of the matrix yet show a mismatch between the workforce's perception of the market and projections in terms of emerging skills and the courses curriculum analyzed in the Skills Matrix.

The Skills of the Future

When confronting the matrix outcomes and the results from the survey, evidence was found that employees and recruiters are misaligned when ranking the most critical domains in the near future. Yet both the survey and the Digital Skill Matrix has shown there is a consensus between the three stakeholders on the importance of one specific technical digital skill domain: Big Data (Machine Learning, Data Modelling, Business Intelligence, AI). Ranked as the Top 1 emerging technical digital skill, all three stakeholders appear to be aligned when it comes to this domain in the midterm perspective.

Figure: Confrontation of Emerging Domains Perception Rates according to Employers and Employees vs. Current Academic Offer



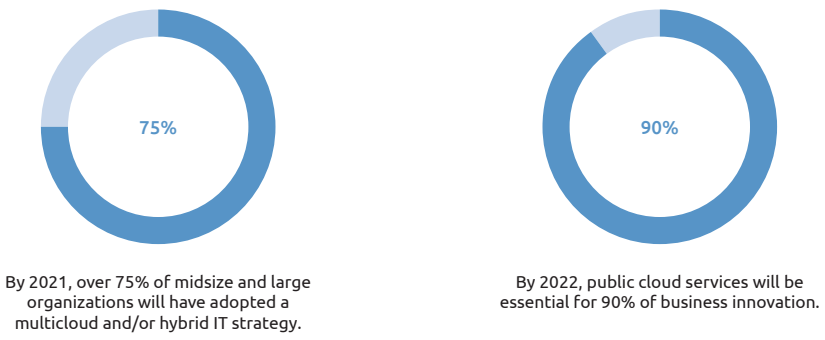
Source : Guepard Group - Digital Skills Matrix - DTR 2020

However, while 5G (RAN and Core Network Engineering) related competencies is ranked as the second most rising skills by the workforce, CHROs don't seem as optimistic about the future of this domain with only 5 out of 124 responses referring to 5G as an emerging domain. On the other hand, the academic sector seems to be aligned with CHROs as the 5G skills only appears 39 times on the 1711 analyzed courses.

Meanwhile, stakeholders from Telecommunication and ISP Sector stressed out the urge to form the digital talents to 5G Ran and Core Network Engineering skills, especially for network infrastructure and services deployment projects, in order to achieve a successful 5G transition.

Cloud Computing skills follow the same discrepancies: when the workforce and CHROs agree to rank it as the third most important skill, it is only covered by 4% of the digital academic offer. The Telco and IT sector yet tends to move towards a Multi-Cloud Landscape, and certain digital skills-set and knowledge could be leveraged within the job domain for engineers in particular.

Figure: Projection of Cloud and Multi-Cloud Infrastructures' Evolution

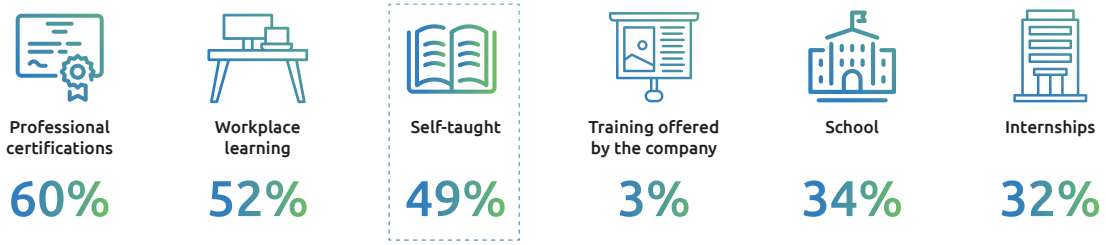


Source : Gartner - Predicts 2019: Increasing Reliance on Cloud Computing Transforms IT and Business Practices - 2018

Sources of learning

On another note, when it comes to acquiring digital skills, different sources of learning can be considered throughout the career path of a professional. Surprisingly, according to ICT professionals, the most used ICT competencies are acquired outside the educational curriculums. 60% of the ICT workers mentioned "Professional certifications and programs" as the main sources of learning digital skills followed by workplace learning (52%), meanwhile only 34% have been learning it at school.

Figure: Sources of learning according to the surveyed digital workforce



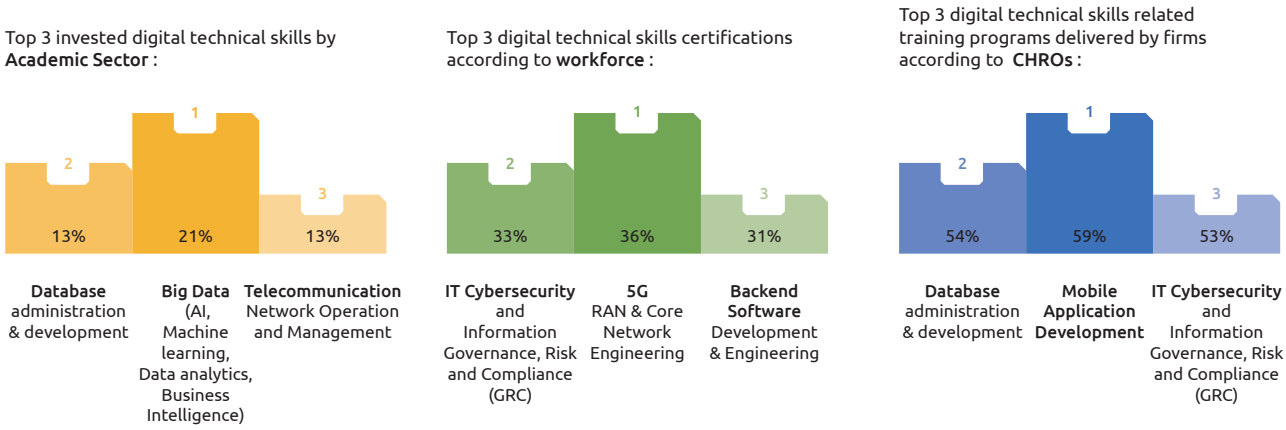
Source : Guepard Group and Think One Research & Consulting – Qualitative study amongst 30 actors and Quantitative study amongst 522 students, 137 employees and 60 CHROs/ICT managers – August & September 2020

The survey has also proven that 86% of ICT employees do believe that professional certifications are important for their career and skills development. Yet only 10% of the academic offer is addressed to professionals, highlighting the need for more specialized professional focused programs in the Moroccan academic institutions.

On the other hand, Moroccan ICT companies seem to be more aware of the importance of professional training and certifications. Based on the CHROs responses, 53% of local ICT companies are currently having an InHouse Talent Cultivation and Training Programs delivery in place.

Figure: Confrontation of Top 3 Most Important Technical Digital Skills Perception according to Employers and Employees vs. Current Academic Offer

Workforce: N = 137



Source : Guepard Group - Digital Skills Matrix - DTR 2020

5G, Security and Software development are the 3 most important certifications according to the ICT workforce. Thus, academic institutions are not investing enough in those 3 domains when addressing professional certifications, for none of the 16 professional certifications analyzed in the matrix are focused on 5G, while only 5% are linked to IT Cybersecurity (GRC), and 18% are related to Software Development and Engineering.

Moreover, none of the 60 questioned CHROs chose 5G when asked "What are the Top 3 most important Skills used by your teams?". Meanwhile, 39% of questioned workforce consider the most important ICT certification to be 5G related. This deepens the gap between ICT workers and recruiters when it comes to the perception of the skills to be enhanced through professional training.

Finally, although 62% of ICT employees have received an NCT programs/training proposal by their company, either internally or externally, 39% are not satisfied by the quality and prefer using technical websites (53%) to maintain up-to-date ICT technical certifications. Consequently, it appears that the Moroccan academic sector should be more oriented toward professionals, and consider collaborating with ICT companies to help digital profiles to adapt to the market's constant evolutions.

The Moroccan Academic sector has demonstrated its ability to shift in order to prepare digital talents to currently used critical skills such as data-oriented ones. Yet, it appears that the market should suffer in the medium to long term from the lack of essential skills related to tomorrow's future digital economy, which are poorly provided by the proposed curriculums. The divergence of perceptions in terms of emerging domains and certifications needs demonstrate the weakness of coordination and synergy between the mentioned stakeholders, resulting in a blatant gap when confronting technical digital skills' supply with the market's demand.

Overall, confronting the results has shown there is an urgent need to update and revise program curriculums in order for the digital talents to follow up and ensure a successful digital transition.

4. The Gap in the Gap

The skills matrix developed in this Digital Talent Reviewmade possible to highlight and assess the misalignment between the talents, the CHROs & IT Managers and the academic institutions programs in terms of digital market perception, needs and offer.

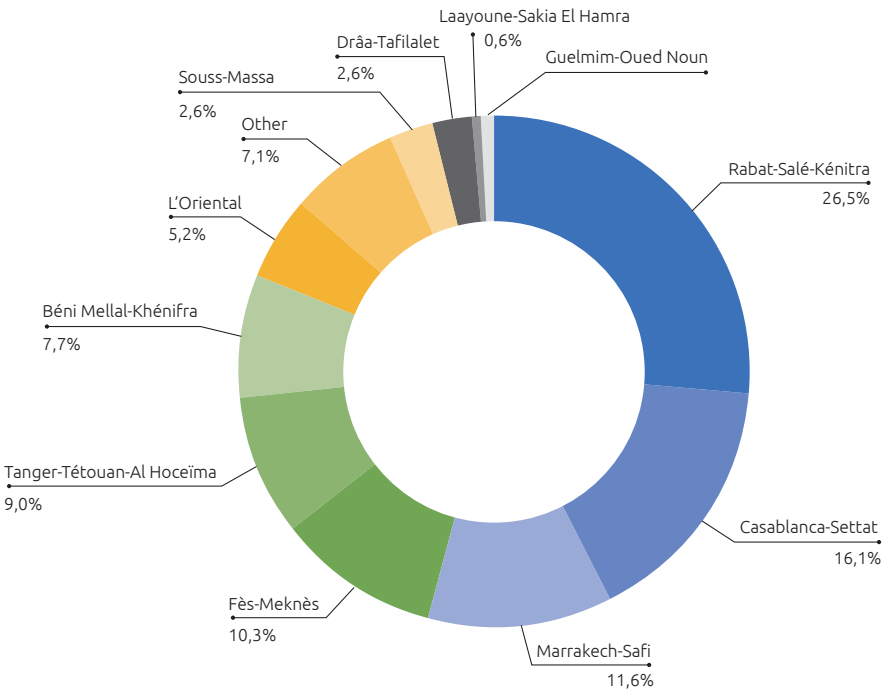
However, when taking a closer look at the skills taught in the analyzed curriculums, a more serious gap seems to actually be at stake, raising serious concerns on the educational structure's opportunities and ability to adapt to a market in constant evolution. Parts of the academic offer seem to be directly related to structural and national level issues linked to strategic topics such as the brain drain, national security, competitiveness, innovation, etc.

Regional concentration of the digital academic offer

Over - coverage in Rabat - Casablanca - Marrakech

Just as the digital market's demand, the digital academic program offer distribution also shows a strong regional concentration, which is coherent with the dynamics of the economy.

Figure: Digital Programs' Distribution by Region

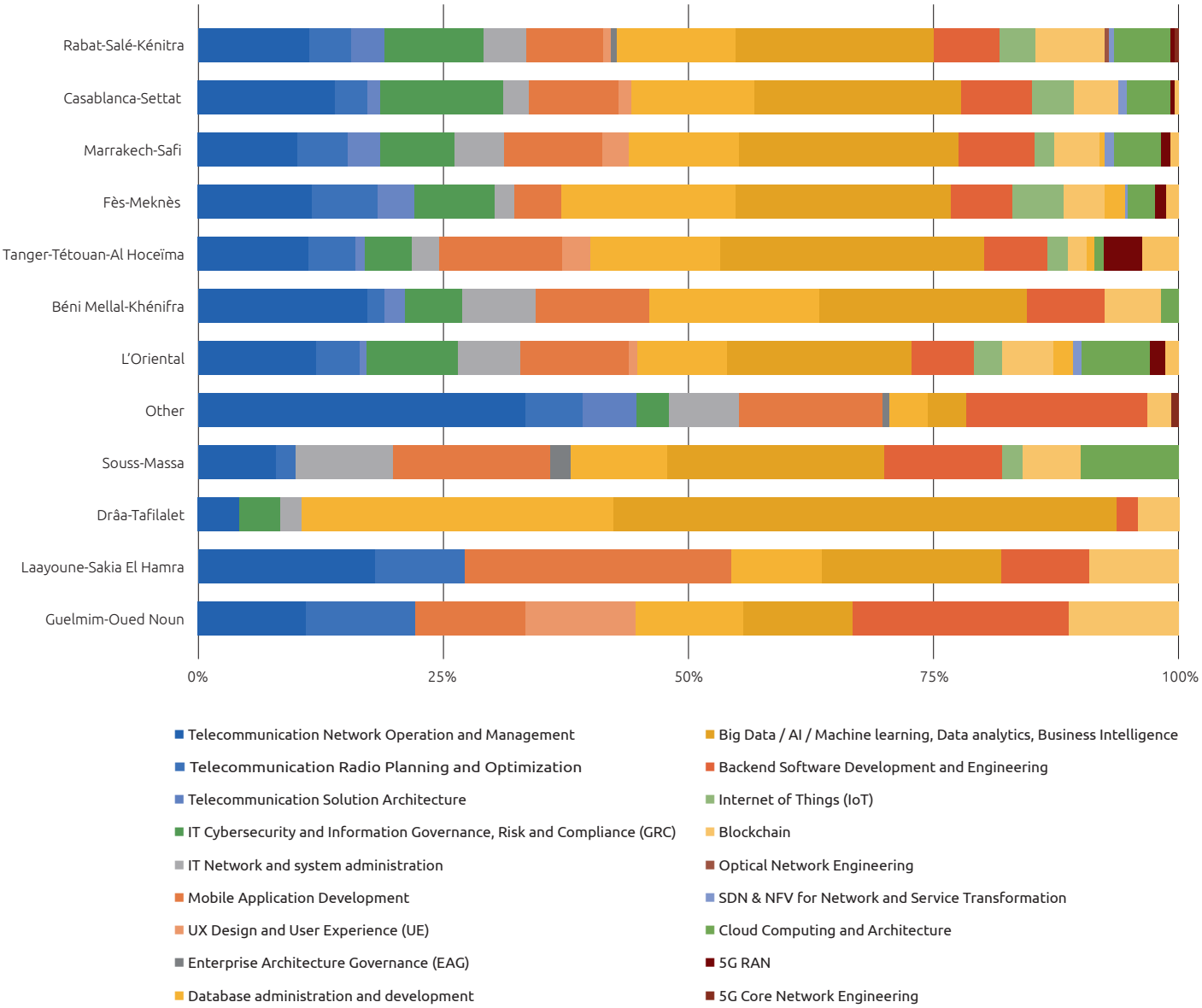


Source : Guepard Group - Digital Skills Matrix - DTR 2020

For instance, three of the most prosperous regions of Morocco, Rabat-Salé-Kenitra (15.2% GDB 2017), Casablanca-Settat (26.5%), Marrakech Safi (11.4%) located in a radius of 600km concentrate more than 54% of available digital programs. Those three regions account for more than 53% of Moroccan GDP, according to the Ministry of Economy and Finance[80]. Hence, the economic imbalance is also found in the distribution of Digital Skills provided by the Academic Sector.

Oddly enough, for no apparent reason, there seems to be an abundance of 5G skills in northern and western Morocco, although the regions of Tanger-Tetouan-Al Hoceima and l'Oriental are not economic leaders, with a combined contribution to the GDP of 15.7%.

Figure: Distribution of digital technical skill domains in ICT programs by town



Source : Guepard Group - Digital Skills Matrix - DTR 2020

[80] KINGDOM OF MOROCCO, MINISTRY OF ECONOMY AND FINANCE. Regional Profiles [Online]. 2019. Available on : https://www.finances.gov.ma

Reducing regional disparities: The leading role of OFPPT

Key player in the social development of the country, the OFPPTs main vocation is to promote the employability of young people through training and qualification courses in order to make them immediately operational in the labor market. The office, founded in 1974, played a major role in accelerating the overall increase of the digital academic offer. That way, in the last 5 years, several new ICT programs have been launched to support the development of this field such as Digital Offshoring taught in all 12 regions of the country, or Artificial Intelligence taught in Casablanca and Rabat.

Moreover, in response to the covid-19 situation the OFPPT launched in April 2020, a new e-learning platform, dedicated to the learning of foreign languages (French, English and Spanish) which will benefit 280,000 trainees.

By covering all of the 12 regions of Morocco, the OFPPT is playing a leading role in reducing the regional disparities particularly in cities where no alternative is existing when it comes to digital education.

Figure: Technical Digital Skills Ranking in increasing order

Digital Technical Skills Domains	Number of courses in which the skill appears	Percentage of courses in which the skill appears
SDN & NFV for Network and Service Transformation	6	0,2%
Enterprise Architecture Governance (EAG)	7	0,3%
5G RAN	18	0,7%
5G Core Network Engineering	21	0,8%
UX Design and User Experience (UE)	27	1,1%
Optical Network Engineering	30	1,2%
Telecommunication Solution Architecture	67	2,6%
Internet of Things (IoT)	78	3,1%
IT Network and system administration	105	4,1%
Cloud Computing and Architecture	109	4,3%
Telecommunication Radio Planning and Optimization	113	4,4%
Blockchain	135	5,3%
Backend Software Development and Engineering	192	7,5%
IT Cybersecurity and Information Governance, Risk and Compliance (GRC)	221	8,7%
Mobile Application Development	242	9,5%
Telecommunication Network Operation and Management	319	12,5%
Database administration and development	326	12,8%
Big Data, AI, Machine learning, Data analytics, Business Intelligence	532	20,9%
TOTAL	2548	100%

Source : Guepard Group - Digital Skills Matrix - DTR 2020

The Brain Drain issue

The current distribution of digital skills offered by the Moroccan academic sector shows a clear over-representation of one domain composed of Big Data, AI, Machine Learning, Data analytics and Business Intelligence, who accounts for 21% of the total. This is not coherent with the Moroccan private sector ICT landscape, for there are very few "national champions" evolving in this specific domain. This means that most of the workforce that has been trained in those skills will either join multinational companies which are offshoring these services in the Kingdom to benefit from a labor intensive price advantage or will aggravate the brain drain towards Europe. In short, the Moroccan academic sector is subsidizing indirectly multinational companies and the export of its talent.

The flip side of this is equally alarming for the Moroccan academic sector is not offering enough courses in skills that can be used in the territory or that are emerging in Morocco. 5G RAN & Core Network domain is a shimmering example of that for it only represents less than 2% of the total, although the country is foreseeing an imminent launch of the 5G Network. This means that Morocco will have to resort to international expertise and hence aggravate its commercial balance by using hard currency. Also, we notice that there is an overall underrepresentation of the skills of the future and an over-representation of mature skills in the academic offer.

The reassuring news for the Moroccan digital sector is that domains such as Telecommunication Network Operation and

Management are pretty well offered and distributed, and that people who have acquired those skills are in a position to upscale them easier to emerging domains through specific certifications.

The need for a paradigm shift

The Internet of Things (IoT) domain represents a milestone in the Fourth Industrial Revolution. IoT allows the delivery of new services and processes without the need of human intervention, and can be used on several domains such as agriculture, transport or industrial processes. This digital domain is also at the center of smart cities development, which represents a strategic stake for Morocco. As a matter of fact, the Kingdom ambitions to become a leader in that area in Africa, and has launched several initiatives to that end. Thus, Rabat was ranked as the 4th smart city in the MENA region, behind Abu Dhabi, Dubaï, and Riyad in the 2020 Smart City Index[81], and Casablanca Smart City[82] was the first African city to be included in the Institute of Electrical and Electronic Engineers (IEEE) Network in 2015[83].

Identified as one of the skills of the future by the surveyed Human Resources Leaders and Talents, the skill is yet poorly covered by the academic offer with only 78 courses enabling them to acquire it. Moreover, contradictory evidence was found when analyzing the results as IoT related skills are more widely taught than 5G whereas the latter domain is one of the prerequisite skills needed when it comes to teaching and learning IoT skills. This shows one more time that there is a lack of synergy and collaboration between the digital stakeholders.

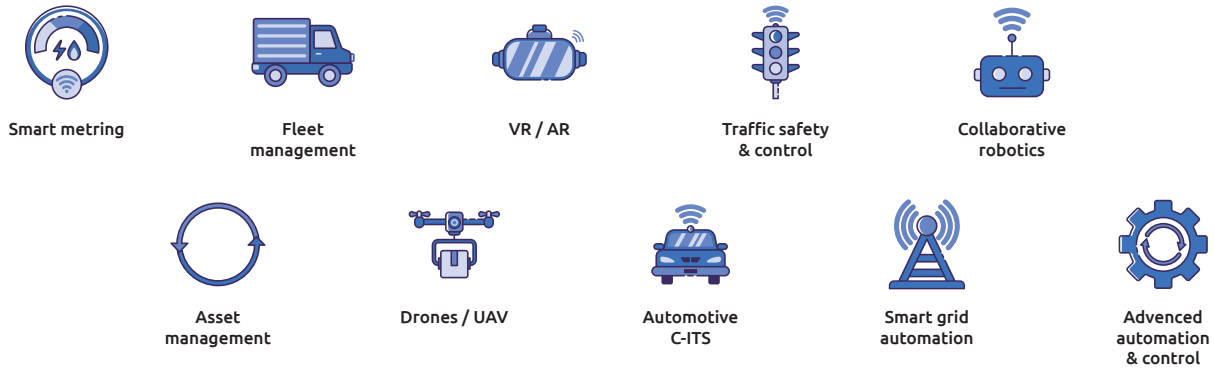
Innovation challenges

Optical Network engineering raises the question of innovation and the link between academics, governments and the private sector for this domain is usually used to ensure high speed connection inside and outside institutions and is also used for research and innovation. As a matter of fact, today's internet era is based on fiber cable due to the low production cost of cables, which allow large data carrying and long distance high speed transmission.

Moreover, the National Telecommunications Regulatory Agency (ANRT) released key numbers on the use of the internet in 2019 experienced a growth of 11.22% of internet use in 2019 (+2.21% than 2018), reaching 25.38 million internet subscribers. Figures also show a serious increase in the fiber-optic network consumption, which reached 121 237 subscribers in 2019 against 37 169 in 2018, not to mention that Maroc Telecom recently stated that all of their domestic transmission network is composed of optical fiber cables.

Optical Fiber Engineering also has huge implications for the financial sector, because optical networks are essential for the speed and reliability of transactions such as trading, a domain in which Morocco ambitions to become an African leader[84].

Figure: Multiple use cases and Industries of the IoT domain



What is crystal clear, is that fiber optic networks are the path forward to getting terabytes of data to Moroccan businesses and consumers. Although Optical Network Engineering represents a crucial area of growth for Morocco, the skills matrix results show that the domain is isolated from the academic offer as only 30 courses allow students to acquire the necessary skills.

Cybersecurity & National Cloud

At the international level, experts consider cybercrimes as one of the top risks organizations will be facing during the 10 next years. Moreover, a recent report from the CGEM highlighted that the Moroccan private sector has undergone 4.1 billion data violations during the first trimester of 2019, while 68% of business leaders stated that cybersecurity related risks are growing[85].

Yet, although Morocco has an established reputation of self made white hat hackers regularly featured in specialized firms, cybersecurity and its related technical skills is not yet at the level ambitioned by the government. This way, on an academic level, cybersecurity is ranked number 5 out of the 18 domains analyzed in our study, whereas many experts consider that cybersecurity should be an absolute top priority. The creation of the General Information Systems Security Directory (DNSSI)[86] in 2015 has been

a strategic move from the government as it includes the monitoring of many areas such as facilities, fraud or risk management.

Directly related to this strategic field, cloud computing has also been in the center of the conversation: as a matter of fact, even though Morocco is undergoing a slow transformation when it comes to the public doctrine, several government forces stated clearly their intention to establish an exclusive national cloud in order to secure vital and essential data such as health records, satellite imagery, public records or files from the justice department.

This issue is also major for Morocco when it comes to relations with Europe for Morocco hasn't already adopted the legal framework on personal data. However, the Kingdom appears to be aware of the challenges at stake, as evidenced by the creation of the National Control Commission for the Protection of Personal Data (CDNP)[87] as well as the creation in 2019 of INWI's data center with Huawei as a partner, which are both considered as positive steps.

By now, the main challenge for Morocco is to ensure, on one hand, that talents are being formed to the current and future cybersecurity and cloud computing needs in terms of skills. On the other hand, Morocco will have to make sure that the lack of policy in personal data will not prevent the country from being exposed to the risks both those domains implies.

5. The Importance of Soft Skills in The Digital Job Market

Complementing specialized Hard Skills, "Soft skills" refer to a combination of personality traits and social attributes that enable someone to be successful in a job role, communicate with others and achieve goals.

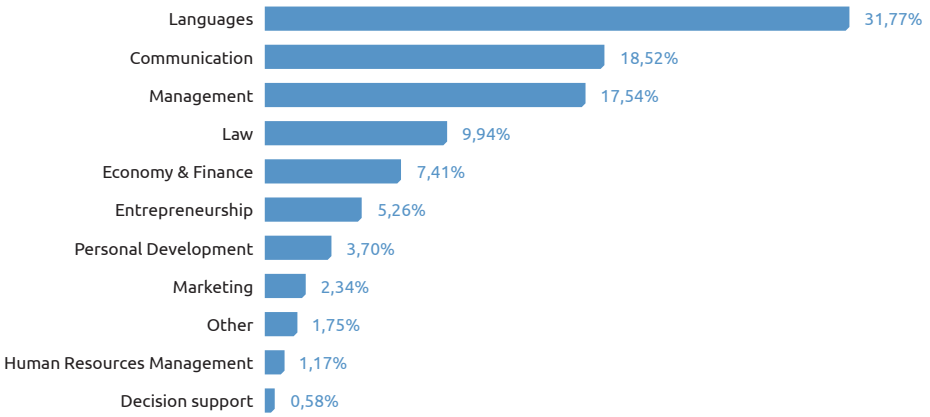
According to ICT recruiters and managers, possessing technical digital skills alone is no longer sufficient in today's job market. As a matter of fact, Soft Skills are now "Hard Skills" for both ICT graduates and professionals. Personal attributes such as the ability to communicate, manage a project and interact properly within pairs and the hierarchy, along with problem-solving mindset, team spirit, proactive attitude, organization, business acumen and presentation skills are required in order to be successful in the ICT domain.

Hence, Business acumen can be defined as a combination of skills such as Management, law, accounting, Finance and Economy, Marketing, Entrepreneurship or Human Resources management, necessary to run a successful business, deal with key business issues, and be able to achieve objectives of the organization.

Our digital talent survey reveals that a lack of business sense is one of the main reasons why digital students and graduates don't embark on business creation. Moreover, according to 28% of the CHROs, business acumen skills need to be reinforced within academic programs. Thus, strengthening this field will be critical as organizations are transitioning into the process of digital economy. On another note, by speaking the "Business language", digital talents could understand companies' challenges and effectively translate their objectives into high-added value projects through entrepreneurship. This shift will enhance the Moroccan digital ecosystem and speed-up the digital transformation process.

Respecting the methodological approach used for the mapping of the Hard Skills, the analysis of the Soft Skills addresses the competency acquired by the programs taking into consideration the International Standard Classification of Education (ISCED). The first step was focused on the identification of 11 most relevant soft skills, followed by a cross-analysis of the raw data from the matrix with results from the CATI & Online surveys. This approach enabled a detailed overview of the perception and expectation of both CHROs and Workforce regarding non-technical skills.

Figure: Soft Skills' Ranking coming from the Digital Skills Matrix Results



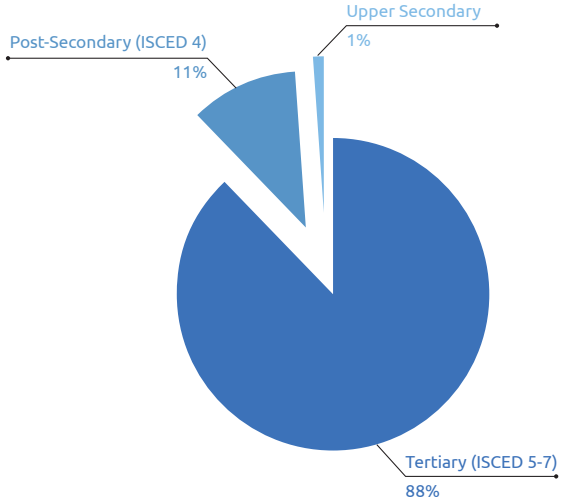
Source : Guepard Group - Digital Skills Matrix - DTR 2020

All of these mentioned skills were merged in three major soft skills family that emerged from the digital skills matrix:

Figure: Soft Skills Groups' Distribution

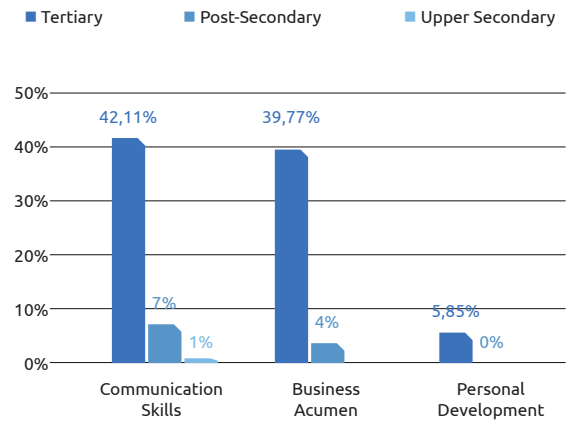
Source : Guepard Group - Digital Skills Matrix - DTR 2020

Figure: Soft skills' distribution by ISCED level



Source : Guepard Group - Digital Skills Matrix - DTR 2020

Figure 17 : Soft Skills Groups' Mapping Comparison according to ISCED Levels



Source : Guepard Group - Digital Skills Matrix - DTR 2020

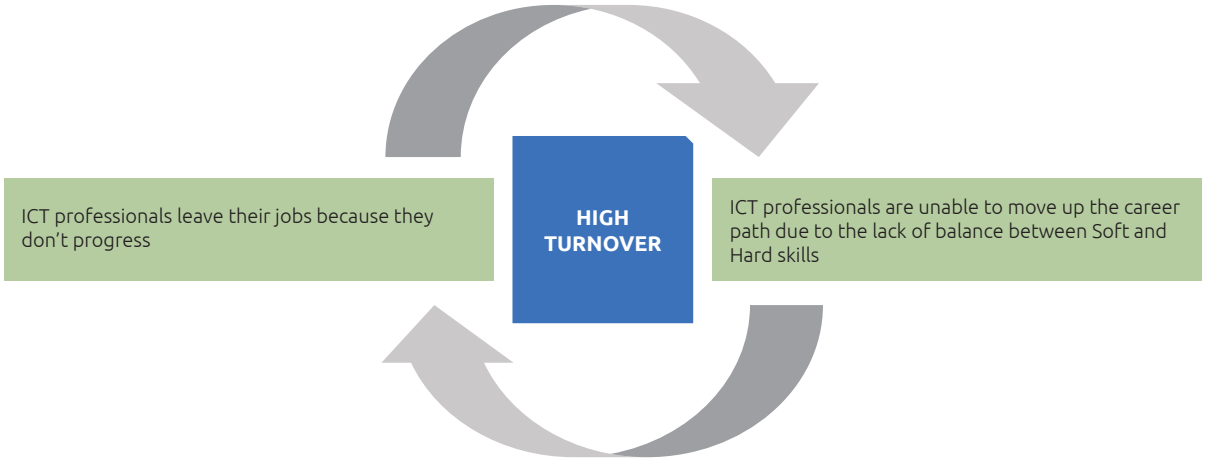
On another note, communication skills, gather language fluency mainly in english and french along with written and spoken expression abilities, including the capacity to draft clear and concise emails. Companies rely on effective communication skills and expect their employees to be able to understand and deliver messages clearly so that work can be accomplished effectively. In digital focused companies, good quality of communication skills will benefit the ecosystem as a whole as it is playing a critical role for achieving an upturn in productivity.

At the Academic level, The digital Skills Matrix has shown that although almost every ICT program is currently including Soft Skills - which represents 17% of the courses -"Lack of Soft skills" remains one of the foremost complains according to CHROs and ICT managers who consider it # 1/5 Recruitment difficulty. This underlines the need to effectively incorporate Soft Skills to ICT programs offered by Moroccan academic sector.

The analysis also shows that both ICT students and professionals have a wrong perception of their own readiness, as 74% ICT students and 76% of workers consider themselves ready in terms of soft skills. This deepens the mismatch between job seekers and market needs.

[81] IMD. Smart City Index [Online]. 2019. Available on : https://imd.cld.bz
[82] JRONDI, Ouafaa, HUET, Jean-Michel, SOUFFLAY, Astrid. Le Maroc, pionnier de la Smart City en Afrique Bearingpoint [Online]. 2015. Available on : https://www.bearingpoint.com
[83] IEEE SMART CITIES. IEEE selects municipalities Kansas City, Missouri, United States of America, and Casablanca, Morocco to engage in IEE Smart Cities Initiative [Online]. 2015. Available on : https://smartcities.ieee.org
[84] CASABLANCA STOCK EXCHANGE. Vision [Online]. 2016. Available on : http://casablanca-bourse.com
[85] CGEM. Business Companies' Cybersecurity :Best Practices Guide Online]. 2020. Available on : https://www.cgem.ma
[86] KINGDOM OF MOROCCO, GENERAL INFORMATION SYSTEMS SECURITY DIRECTORY. Directive nationale de la sécurité des systèmes d'information [Online]. 2018. Available on : https://www.dgssi.gov.ma
[87] CNDP. Missions [Online]. 2013. Available on : https://www.cndp.ma

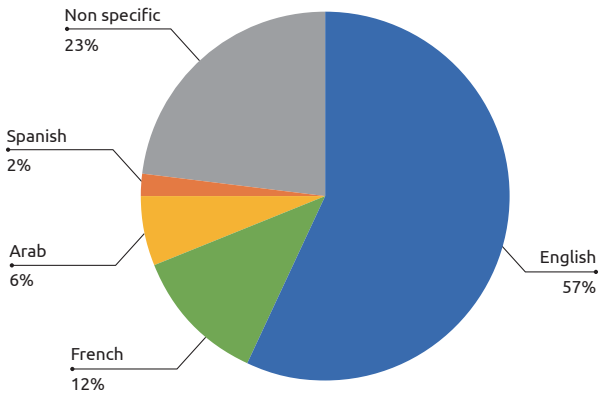
Figure: Job Turnover Illustration



Source : Guepard Group and Think One Research & Consulting – Qualitative study amongst 30 actors and Quantitative study amongst 522 students, 137 employees and 60 CHROs/ICT managers – August & September 2020

With an average job turnover of 2 years, the ICT industry also suffers from a high turnover rate for both semiskilled and higher qualification employees, it's also interesting to take into consideration that 69% of the workforce confirmed a "Faster career progression" could prevent from changing jobs.

Figure: Language Courses' Offer Distribution



Source : Guepard Group - Digital Skills Matrix - DTR 2020

As 57% of the ICT programs include English, while less than 12% include French as a specific subject although most Moroccan companies use the French language to communicate. It appears that academic institutions might be encouraging ICT students and graduates to favor English instead of French. This misalignment in terms of linguistic skills might be negatively impacting ICT graduates and workforce to easily adapt to local companies' culture, finding job opportunities and progressing faster in their career.

Furthermore, although 50% of the Soft Skills offer is related to "Linguistic and Communication skills", the overall level of proficiency in both French and English still needs to be enhanced for ICT talents, according to recruiters.

Overall, 88% of the courses addressing Soft Skills are related to the Tertiary level of education (Bac+3 to Bac+5), while less than 1% of them are taught in the Upper Secondary level, and 12% of the courses Soft skills are taught in the Tertiary level (Bac+2). Knowing that Semi-skilled employees represent an average of 65% of ICT employees in Moroccan companies, it appears that more professional skills must be implemented in these curriculums to help improve semi-skilled employees' readiness for the job market.

When it comes to the ICT industry job employability, TOP 3 Soft Skills targeted by Employersare "Problem-solving" (67%), "Team Spirit" (56%) and "Efficiency & Proactive attitude" (44%). Nevertheless, less than 3% of the courses are related to Project Management, which would involve a better mastery of those competencies.

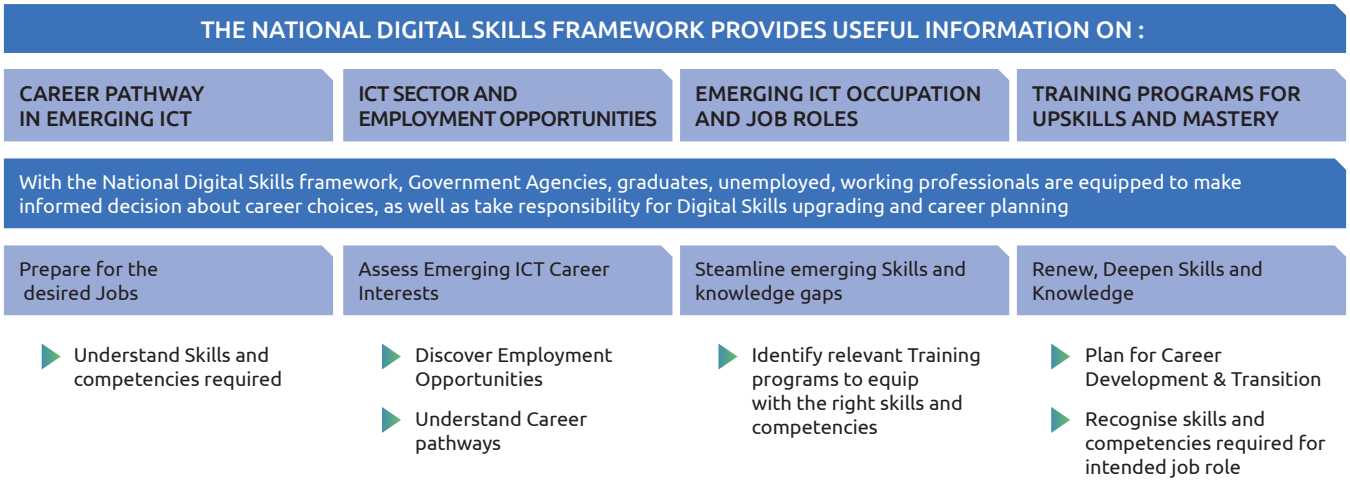
In the same way, academic institutions don't nurture enough the Personal Development of ICT talents, as it only covers 4% of Soft Skills. Meanwhile, weaknesses are seen in some key professional competencies such as self-confidence, creativity as well as critical thinking and presentation skills.

While 44% of Soft Skills related courses are Business related (entrepreneurship, management, marketing, HR, law, Economy & Finance), 92% in the Tertiary level of education (Bac+3 to Bac+5), only 3% of the workforce is Entrepreneur or self-employed. However, 16% of ICT graduates & last year students and 32% of the ICT professionals expressed a desire to create their own business. In fact,the academic sector is not nurturing key entrepreneurial skills to promote business creations and business acumen. To fill this gap, companies developed programs designed to help students develop their entrepreneurial skills in order to boost the startup community in Morocco. Some of the best-known programs are Huawei ICT Academy, 212 Founders by Caisse de Dépôt et de Gestion (CDG) and the next society which is funded by the European Union.

6. National Qualification Framework Scan

The Digital Skills Matrix was also designed to provide an added dimension to complement the Morocco National Qualification Framework (NQF) in terms of digital offer, and support that way critical ICT skills and competencies' translation for ICT practitioners and Managers across the Kingdom. This section of the report aims to provide a reference framework in regards to the analyzed skills, and may be used as a translation tool that offer greater readability of the digital education and training across Morocco.

Figure: Purposes of National Digital Skill Frameworks



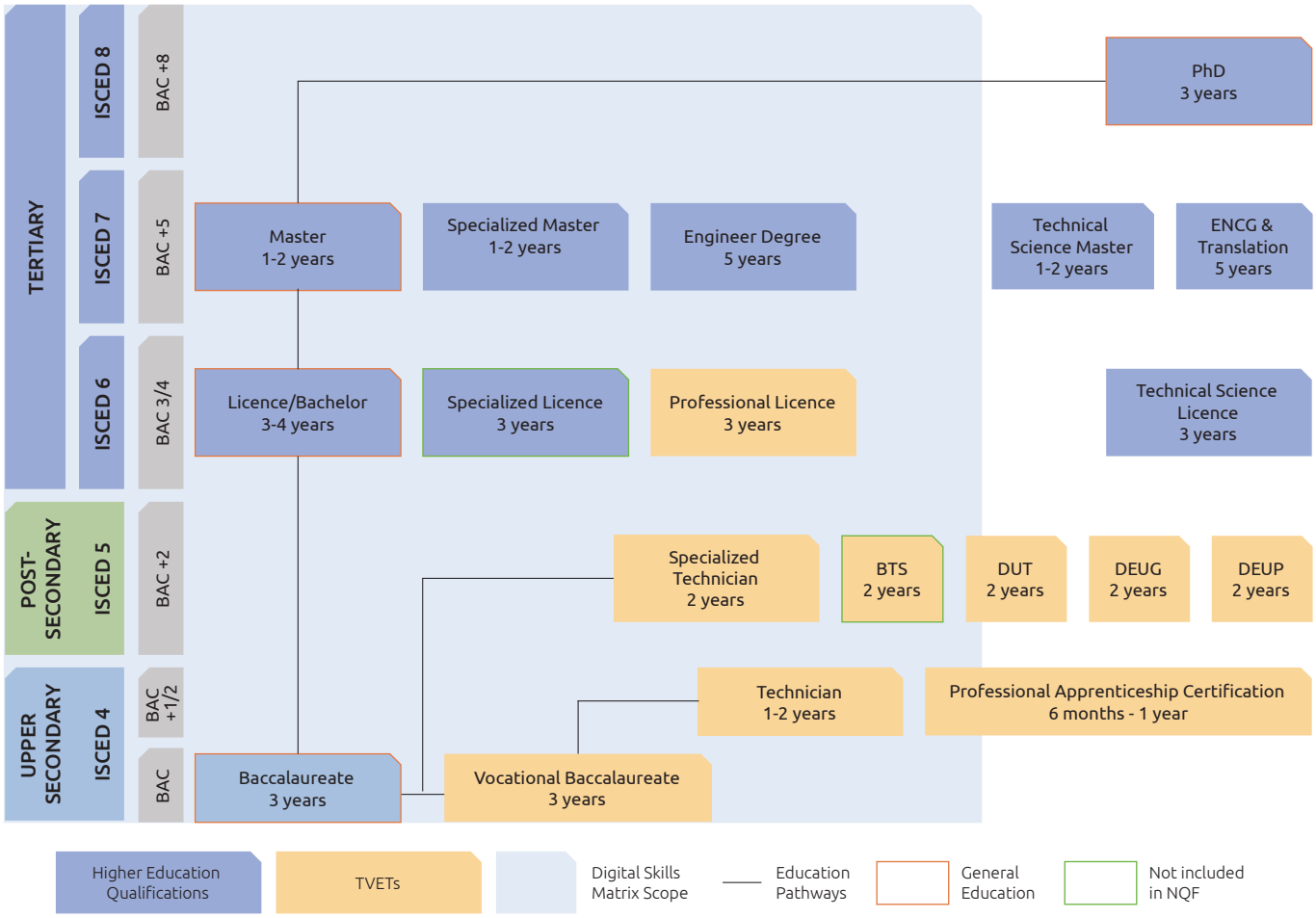
A National Qualification Framework (NQF) is an instrument used to classify a country's levels of qualification according to a set of learning outcomes expected at each of those levels. Since 1995, the development of NQFs has become a major international trend when it comes to reforming national education and training systems in developed countries. Nowadays, NQFs experience unprecedented economic, social and technological changes implying the need to create adaptive frameworks that meet emerging needs coming from the internationalisation and globalisation of the markets, technology advances, migration, etc.

The European Training Foundation (ETF)[88] is the EU agency that helps transition and developing countries to reform their education, training and labour market systems in the context of the EU's external relations policy. In that regard, in 2013, the Moroccan NQF was validated by a Ministerial conference, then was updated and revised in October 2015 with the support of the ETF.

[88] ETF. Morocco - NQF Inventory [Online]. 2018. Available on : https://connections.etf.europa.eu

The Moroccan NQF is structured in eight levels (1 to 8). The chart below shows the NQF levels and education levels/respective diplomas starting from level 4 as levels 1 to 3 include primary and middle school education, which were not included in the Digital Skills Matrix.

Figure: Moroccan NQF Framework (Level 4-8) and Digital Skills Matrix Scope



In Morocco, the Higher Education Qualification System is composed of both public and private academic institutions. As a matter of fact, Moroccan higher education comprises twelve public universities, five public-private universities, and two-hundred and seven private institutions[89]. Although private institutions are authorized by the Ministry of Higher Education, proposed programs must be accredited by the latter Institution in order to be recognized. Finally, Technical and Vocational Education and Training (TVET) offer diplomas such as Professional Licenses, DUT, Technician, Vocacional Baccalaureate, Specialized Technician…

At all the 8 levels, the Moroccan NQF offers a generic guidance of knowledge, skills and competences which are achieved at each level. Our study is focusing on the levels 4 to 8 of the International Standard Classification of Education (ISCED), and includes programs from upper secondary level to executive masters for Bac+5 and more.

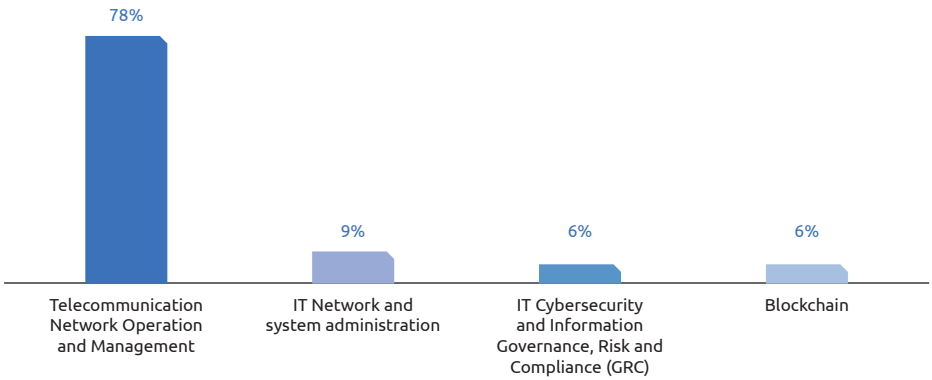
Preparing Bac to Bac +2 profiles to access the job market

When analysing the academic offer related to the ISCED 4, which starts with vocational baccalaureate diplomas to technician certificates, the lack of diversity in the skills acquired seem quite obvious, as only 4 out of the 18 digital technical domains are being covered by these curriculums. Furthermore, more than 78% of the courses delivered to upper-secondary students are focused on acquiring knowledge linked to the Telecommunication Network Operation and Management domain.

This can be explained by two main factors. First, technicians and vocational upper-secondary graduates are focusing on the basic competencies in order to quickly enter the labour market. The short duration of these trainings, is not allowing Technical and vocational educational training (TVETs) to provide stronger knowledge in various domains and thus, need to address more specifically the most in-demand skills. This approach can help semi-skilled ICT workers, to get stronger abilities in a very specific field, during a short training time despite a lack of general knowledge as a basis.

Moreover, once they enter the corporate world, chances for upper secondary graduates to enhance their career prospects are limited knowing the lack of professional training offered to semi-skilled workers. This can explain why "YouTube Tutorials" are the most used tools for solving challenges, according to 70% of the workforce.

Figure: Technical Digital Skills' distribution in the Upper Secondary level (ISCED 4)



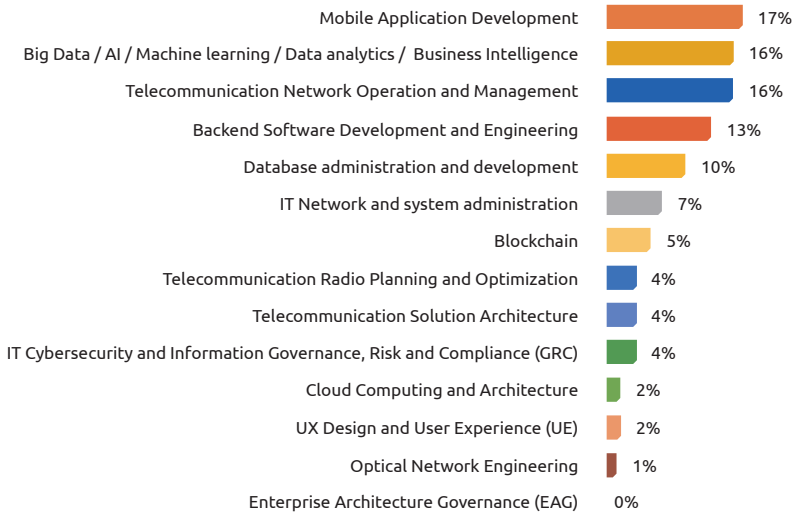
Source : Guepard Group - Digital Skills Matrix - DTR 2020

[89] MERIC. Système éducatif marocain : Rapport national [Online]. 2019. Available on : http://www.meric-net.eu

Semi Skilled profiles portfolio

On the other hand, Post-Secondary programs (ISCED 5) - which include BTS, DUT and specialised technicians degrees up to Bac+2, are being much more diversified in terms of digital technical skills covered by the ICT programs. Although this level of education only gathers 206 out of the 2547 total skills identified in the digital skills matrix, it appears that courses are taught in a scattered way : students in Post-Secondary or Non-Tertiary levels graduate to acquire competencies in 13 out of 18 digital technical domains only.

Figure: Moroccan NQF Framework (Level 4-8) and Digital Skills Matrix Scope



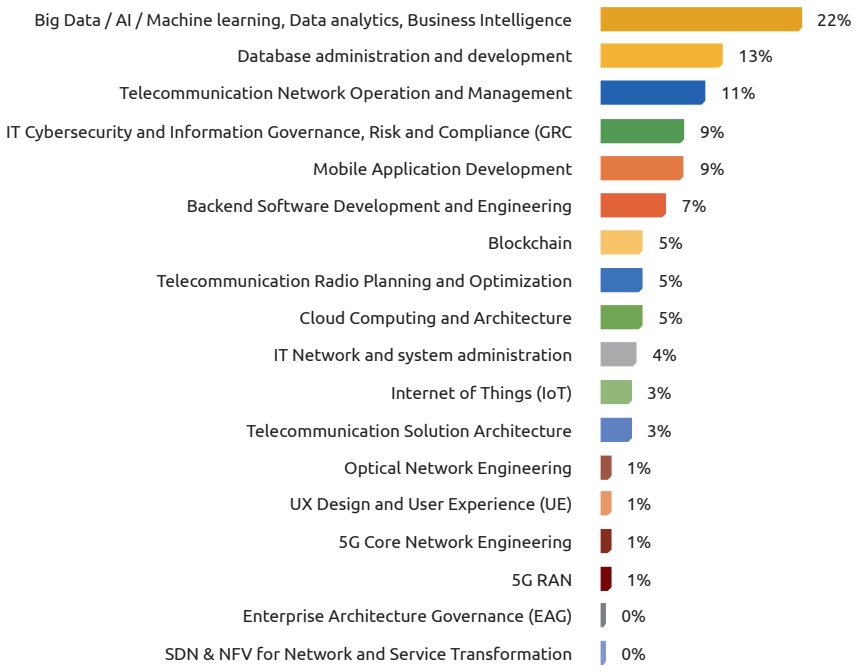
Source : Guepard Group - Digital Skills Matrix - DTR 2020

When taking a deeper look into the figures, it appears that 4 major domains gather over 60% of the skills delivered to this educational level. Hence on the 206 skills identified at this level, 17% are related to Mobile Application Development which makes it the most acquired competency by the bac+2 graduates. Big Data related domains and Telecommunication Network Operation and Management both totalize 16%, while Backend Software Development and Engineering represent 13%.

High Qualified Students Scan

Scanning the Tertiary level programs shows that Bac+3 to Bac+5 graduates benefit from a full spectrum of technical skills when it comes to digital academic offer. Comparing LMD cycles and engineering studies showed that both pathways seemed fairly similar in terms of digital technical abilities delivered. However, LMD cycle curriculums provide more skills in the Big Data family (26%) than the engineering pathway (20%). Same trend happens to appear for the Database administration domain which represents 16% in LMD and 12% in engineering studies. Yet, engineering students seem to benefit from more courses allowing them to acquire skills in other domains such as Cybersecurity, Telecommunication Network, Internet of things or Cloud Computing.

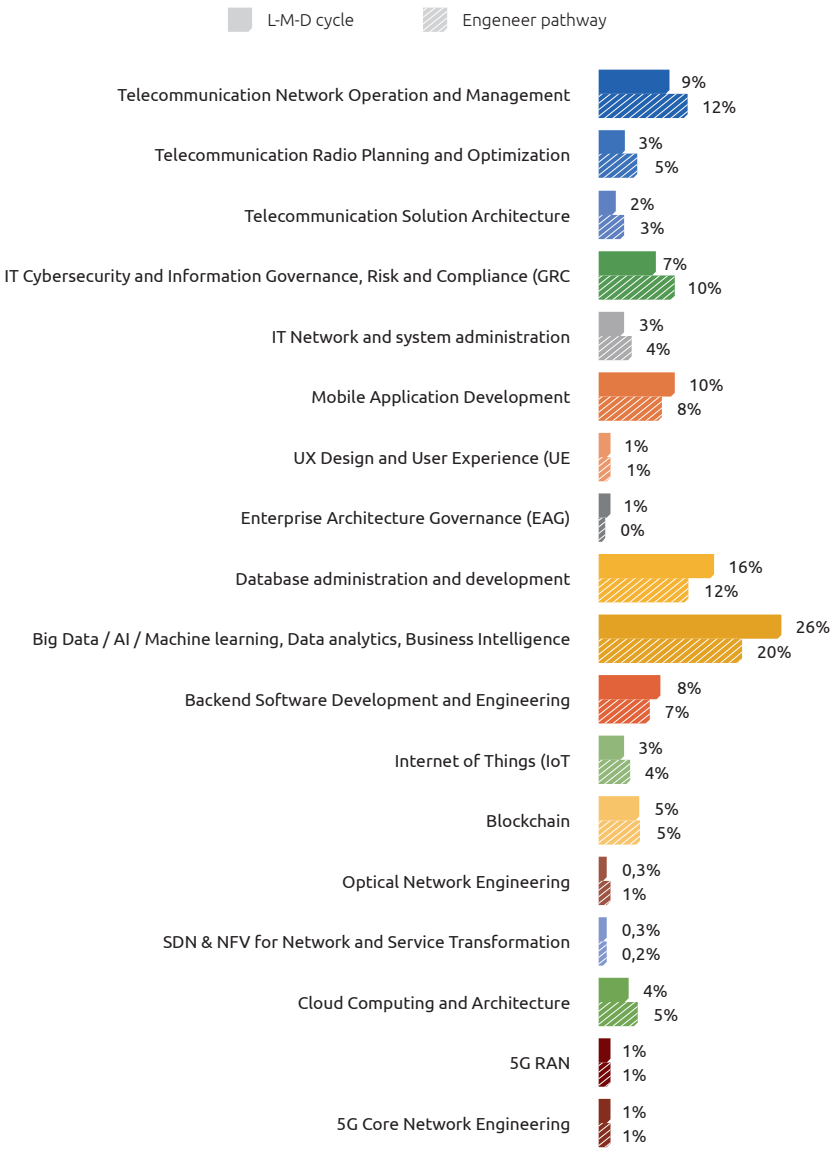
Figure: Technical Digital Skills' distribution in the Post-Secondary level (ISCED 6-8)



Source : Guepard Group - Digital Skills Matrix - DTR 2020

Overall, both LMD and Engineering pathways are strongly focused on Database administration and Big Data, AI, Machine Learning, Data Analytics and Business Intelligence domains. Thus, the latter domain appears 500 times out of the 532 total identified technical digital skills offered in this field (94%). This raises again the Brain Drain issue : highly qualified profiles appear to be trained either in areas which are poorly present in the moroccan labour market, or in multinational companies which attract these types of profiles every year out of the Kingdom.

Figure: Technical Digital Skills' distribution in LMD Cycles vs. Engineering Degrees (ISCED 6-7)



Source : Guepard Group - Digital Skills Matrix - DTR 2020

Finally, the lack of high-end critical domains, such as 5G, Optical Fiber or SDN network engineering, appears once again under-represented in both pathways (5% or less). As a matter of fact, this factor along with the need for the implementation of a more diversified digital skills portfolio, can slow down the development of a strong digital ecosystem in the country.

7. Industry Job Outlook

Last but not least, the Digital Skills Matrix was used as a foundation to identify critical skills set requirements linked to each of the 18 identified technical digital skill domains while confronting it with corresponding job outlook and projections in Morocco in the two to five years to come :

The future of **Telecommunication Network Operation Center (NOC) Management** is promising since the demand is constantly growing. Network Operation Center (NOC) Managers are necessary job roles to ensure the stability and success of the system. As telecommunication technology continues to grow such as 4G transition roadmap to 5G, the demand for such professionals increases to meet growing Telecommunication, ISP, Data Centers and related sectors. The field is highly competitive, therefore candidates with an educational background, certifications, and working experience in the field are more likely to advance in the job place.

Technical skills set requirements:

- Knowledge of network management platforms such as Nagios, BTI PRONX, CACTI, ADVA NMS, SYSLOG, etc.
- In depth knowledge of Organization Network Infrastructure Technologies;
- Practical skills in all networking aspect including IP, TCP, VPNs, Routers, Switches, and Firewall;
- Network Outages management and Post-Mortem root-cause-analysis such as alarm handling, troubleshooting and resolution; Build, develop, and Lead remote team of technical NOC resources;

Telecommunication RF Engineering is one of those fields that generate many job opportunities. As Communication technology continues to grow, recruiters are looking for technical competencies involving network provisioning, system integration, programme coding, and configuration. To further increase their value, graduates, and engineers can earn certifications to boost their career path roadmap in this sector.

Technical skills set requirements:

- Knowledge of GSM, UMTS+HSPA, LTE systems;
- RF Planning & Optimization engineering or team lead (RNO/RNP);
- Utilization of tools for RF Planning, Propagation models, RF Optimization, protocol analysis, etc;
- Radio Coverage & Capacity Dimensioning, EF Planning & Optimization, E2E Optimization (KPI), performance monitoring, site engineering and network audit;
- Support performance KPI negotiating with operators before or during project implementation;

Telecommunication Solution Architects, are particularly critical roles in the Telecom and IT sector for overseeing complex systems and developing solution architecture and technical scope. Solution Architects have a diverse range of skills with broad and up-to-date knowledge of telecom networks, as well as an understanding of quality standards, legislation and best practice in the Telecom and IT Industry. This job acts as a bridge between technology and the business side. As the next wave of network transformation is further fueled by 5G, driven by the need to deliver both network services and new AI-Based edge services across multiple network locations, the demands will depend on the qualification and experience.

Technical skills set requirements:

- Familiar with Industry standards eTOM and ITIL;
- Knowledge on Telecom OSS System and Database, Mobile Data Core Architecture, Mobile Voice Core Architecture, Mobile Network Service Control Layer and Messaging;
- Knowledge Mobile/Fixed network, O&M processes, with certain degree of programming skills (JavaScripts, Python, Ruby, etc);
- Posses O&M analysis capabilities and OSS Solution Planning and Design;
- Knowledge of Traffic Enforcement/ Management Solution;

Cyber-Security governance jobs are growing significantly faster within the region. There is a severe workforce shortage of skilled, experienced, and seasoned Cyber-Security professionals in the labor market. Yet, career paths can vary. For instance, someone who aim to become a database security, may first work as a database administrator. In a similar outfit, an individual who wants to work in cyber security governance might begin as an IT auditor, risk manager, compliance officer, IT control manager, etc. Hiring trends are strong, Industries such as Telecommunication, Banking and Finance, BPO/ITO continue to hire individuals with the right experience and qualifications.

Technical skills set requirements:

- Familiar with overall IT Infrastructure/IT Technology understandings (OS, WAN/LAN/CPIP/IDS/IPS, Firewall);
- Conduct operational and process reviews in compliance with all regulatory standards (ISMS, GPIS);
- Setup/Implement/maintain IT Security related solution/system including network security monitoring, NAC, L2/L3 firewall, VLAN, VPN Technology, Endpoint detection and response solution, Backup Solution;
- Possess knowledge of IT Security and Control Solutions (e.g. Security Incident Event Management SIEM), Intrusion Detection System (IDS), Compliance Monitoring Tools, Data Leakage Protection (DLP), Web Application Firewall (WAF), Web Proxy Gateway & File Integrity Management (FIM)
- Familiar with standards and requirements such as ISO27001, PCIDSS;

Lately, the tremendous demand for new and innovative mobile apps continues to grow has increased the need for Mobile Application Developers especially with the current trend of switching project development from web environment to mobile. Many of these job roles require the candidate to have strong programming knowledge and skills in C++, C# and Java along with Android SDK, and familiar with leading tools. Many of the recruitment job agencies indicate the demand pipeline will continue to increase and expected to grow substantially in the next few years.

Technical skills set requirements:

- Development language skills in C, C++, C#, Java Programming;
- Kotlin / Java (For Android), or Swift/ Objective-C (For iOS)
- Monitor performance, Develop, test and bug fixes for Mobile App / Web Application;
- Implement Application Programming Interface (API) to support mobile functionality;
- Familiar with Unit Cycle Testing, System Integration Testing;
- Familiar with cross-platform development tools, Xamarin, Flutter, and React Native;

The consistent demand for **IT Network and System Administrators** despite an economically challenging position continues to demonstrate that many sectors hire trained and certified network administrators to ensure network system availability. IT Network and system administration specialists are in charge of installing, supporting, and managing the networks and computer system in order to keep the information flowing. To further increase their value, graduates, and engineers can earn certification with the correct career path roadmap in this sector.

Technical skills set requirements:

- Familiar with administration of Operating System, Server Environment, Networking Setup and Support;
- VPN and Routing & Configuration on Firewall;
- Knowledge of NAT (Network Address Translation);
- Familiar with installation, configuration, and troubleshooting, CRM application;
- Monitor Network Performance and Functionality along with respond to L1 and L2 connectivity issues to L3 Network Engineers;

Both **UX and UE designers** umbrella covers a vast array of specialist roles, each with their own specific requirements. Key prominent skills for UX include User Research Ability, Impeccable Visualization, Wireframing and Prototyping and familiarity with coding. On the other side of the table, UI design is majorly focused on the design of the interface elements used by the users to complete and accomplish a certain goal within the application. In other words a small but integral part of the bigger machine of UX. In the age of digitalization, UI designers are more important than ever. With the rise of artificial intelligence, VR, voice technology, along with Big Data, UI Designers have a critical role to play in ensuring that technology is accessible and inclusive.

Technical skills set requirements:

- Familiar with related disciplines of web design, mobile web, wireframes user flows, process flows, specialize in UX & UI
- Knowledge in Front-End Development, CSS, HTML and Javascripts for rapid prototyping;
- Familiar with Design Tools (e.g. Adobe photoshop, Illustrator, Premiere, AfterEffectetc);
- Conduct close project alignment with developers and coordinators to fulfill the desired design;
- Illustrating design ideas using Storyboards, processflows, and sitemaps;

Enterprise Architecture Governance is a practice encompassing the fundamental aspects of managing business strategies. Our insight indicates, a well designed enterprise architecture governance structure can be essential in reducing IT costs, and risks while accelerating decision making and delivery. Enterprise Architecture Governance professionals require technical knowledge and experience. They need to understand software integration and information architecture, in order to be able to optimize a business operation.

Technical skills set requirements:

- IT Service Management Framework (ITIL);
- IT Infrastructure Management (ITIM);
- IT Service Management (ITSM) incorporate IT services into overall business needs with tools such as SysAid and ServiceNow;
- ITSM/COBIT Audit Tools from an IT process perspective;
- Enterprise Architecture Management (EAM) reviewing and consolidating detailed architecture decisions and migration plans;

The role of **Database administration and developer's** covers capacity planning, installation, configuration, database design, migration, performance monitoring, security, troubleshooting as well as backup and data recovery. There is great demand in database-software, and software-application sectors such as Banking and Finance, Telecommunications, and BPO/ITO. As we go deeper into the Big Data era, many see the role of the DBA evolving into specialty DBA's with distinct expertise. Specifically, System DBA should have insight into cloud technologies, with the roles transforming into "DevOps specialists".

Technical skills set requirements:

- Information Systems and Modelling using XML;
- Relational Database Design;
- Information Retrieval Systems;
- Relational Database Management System;
- Familiar with software such as SQL, Oracle-based system, and Industry lead open sources RDBMS;

As organizations race to harness and utilize **Big Data, along with business competition, specialised data professionals** are in high demand and continue regionally, for analytic skills who can utilise data to make better business decisions. Candidates should acquire skills on SQL Database & Query, Data Mining, Data Modelling with algorithm, etc. Big Data Career paths, encompass both Data Management and Data Analysis roles. Database Developers and Administrators are responsible for developing and maintaining the IT infrastructure that supports big data. Other roles focus on using big data to generate actionable insights organizations can use in decision making, strategic planning, and business development. The field is highly in demand, therefore those with an educational background in the field, certifications, and working experience are more likely to advance in the job place.

Technical skills set requirements:

- Programming Language in Python, Java, C++ and etc;
- Quantitative and Qualitative Data Analysis;
- Data Mining;
- Business Process Alignment and Data Visualization;
- Data Structure and Algorithm;
- QL and NoSQL Database;

With the growth of technology, opportunities in **backend software development** jobs are scaling and shaping together with it. Having to know Java and C along with competition in Java-based backend roles is rather limited. Instead getting ahead in the backend software development career would be to equip with common languages like Python, PHP, Node.js.

Technical skills set requirements:

- Develop software with C++, Python, PHP, Go, Java, Node.js;
- Relational Database MS SQL, ORACLE;
- Familiar with Debugging Skills
- Object Oriented Programming Concepts and Methodologies
- Backend Software design, development, integration test, system deployments

Internet of Things (IoT) offer a range of career opportunities in embedded systems such as cybersecurity, software development, etc. Key future trends point to adoption by top industries such as Healthcare, manufacturing, utilities, transportation, and consumer products. Jobs related to IoT are expected to increase in tandem with industry growth in the coming years across industries, though growth may be slower in some sectors than others.

Technical skills set requirements:

- Embedded Software Development;
- Microcontroller Programming / Arduino programming language;
- Node.js use in Machine to Machine (M2M communications);
- Machine Learning Algorithms / Data Sensors to create smart devices;
- Electrical Engineering/Embedded device development for mobile apps/ Radio Frequency (RF)/ Analog and microwave engineering for communication systems and GPS on the devices;

The **Blockchain** job market is thriving regionally and globally. **Blockchain** has been at the forefront in areas such as Distributed Systems, CryptoCurrency, Distributed Apps, Distributed Ledger technologies[50]. Building the basic skills and knowledge of distributed computing, decentralization, smart contracts, and Dapps along with javascript for web development and Solidity, are the essence of the blockchain. As Blockchain technology continues to evolve, so will the professional opportunities it makes possible.

Technical skills set requirements:

- Data Structure and Algorithm;
- Blockchain Architecture;
- Smart Contract Development;
- Front End and Back End Development, API Handling, Request Handling, and GUI's;
- Cryptography algorithms usage and methods;

The demand for **Optical Engineering** related job roles will continue to grow for as long as optics offers the most communication bandwidth of any other technology. As an optical engineering professional, he or she is responsible for the planning, designing, implementation or maintenance of an optical network. Optical Network Specialists ensure that networks operate properly in terms of the services that run over them including video, data and voices. There is a variety of different types of network with the skills to work in such as global submarine networks, access networks, data center networks, optical backplanes, and etc.

Technical skills set requirements:

- Route Planning and Network Designing;
- Optical Network Equipment Procurement along with preparation of fiber optic and network equipment specifications;
- Deploying and Configuring optical network equipment;
- Testing and Supporting optical networks in various stages of the development;
- Optical Network monitoring and restoration;
- Optical Network acquisitions;

Over the past couple of decades, there has been explosive growth of new cloud platforms, and startup organizations bringing their own products to market, along with expansion into providing hosted Infrastructure (IaaS), Databases (DBaaS), and Platform (PaaS) as a services. Some of the cloud job roles, including Cloud Developers, Engineers, and Architects provide planning, analysis, design, implementation, and administrative support for various types of cloud services. Organization adoption of Cloud Computing is not only expected to grow, as it gets cheaper, more secure, and flexible in deployment. The number of openings continues to increase year-over-year as organizations search for talents with relevant skills and knowledge to support transition to cloud based.

Technical skills set requirements:

- Linux/Unix Operating Systems, orchestration, automation and databases such as NoSQL;
- Optimize Network Infrastructure for IaaS, SaaS, PaaS, and other cloud application within network;
- Containerization and Orchestration Kubernetes, Red Hat Openshift;
- Monitor Cloud system for optimal performance and establishes and monitor best practices, policies, and procedures;
- Architecture and Design Background in Server and Cloud Technologies;
- Posses expertise and knowledge/ methodologies of software development tools such as GIT, Kubernetes, Dockers, Jenkins, Docker, Ansible, etc;

SDN and NFV technologies are critical to the success of network and services transformation for communication services providers, including Telecommunication Carrier, Internet Service Provider (ISP) and Enterprises. As organizations move towards network and services transformation and continue to grow,the skills necessary to achieve transformation results are scarce. Key challenges include business challenges migration to cloud-centric, hybrid cloud, dynamic network-services. The SDN & NFV for Network and Service Transformation specialists are gaining in demand, with estimation to grow further in tandem with the organization needs of network and services transformation. To further increase value, graduates, and engineers can earn certification with the correct career path roadmap in this career sector.

Technical skills set requirements:

- Orchestration with Integration to current cloud management platforms;
- Advance Network and service planning with Virtualization (Data Center networking, storage, containers);
- Plan, Implement, integrate, migrate, perform acceptance tests for Core network areas including CS CORE, PS/EPC, VoLTE, VoWIFI, VoBB, HLR, STP;
- Analyze Network Performance, and optimize Network Architecture;
- Possess expertise in NFV/CloudOS/VNFM/IP;
- Possess understanding of the blocks in MANO architecture;

Regionally, Mobile Network Operators (MNOs) will be looking for more **5G RAN Talents** from their forthcoming 5G investments and network capacity growth, while maintaining flat capex budgets. Future trends indicated, key technology areas include Cloud-RAN, Small-Cells, and Self-Optimizing Network (SONs), Network Function Virtualization (NFV), Software Defined Network (SDN), Network Slicing, IoT that MNOs will invest in. Our analysis indicates organizations will be sending their existing engineers to participate gradually to evolve their skills and adapt to these new technologies.

Technical skills set requirements:

- 5G RAN Architecture;
- Design and Configuration of RNC and RNC Interfaces (lu, lub, lur);
- Site implementation of 4G and 5G Radio Planning and Deployment (Rollout);
- 5G QoS requirements;
- Plan and coordinate Integration of new Network Elements (NE's) such as Service Orchestration platform into 5G Mobile RAN;
- Create and execute the test cases for the Radio Access Network;
- Administer 5G Mobile Radio Network Planning Tool and system maintenance including software and hardware upgrades, database management,and generate radio coverage prediction plot;
- Perform the network analyzer test with other tools for its performance;

The new 5G Core Architecture, as defined by 3GPP, utilised cloud-aligned, Service Based Architecture (SBA), that spans across all 5G functions and interactions including authentication, security, session management and aggregation of traffic from end-devices. The role requires expertise in emerging telecom technologies such as 5G Network Slicing, and/or NFV MANO with extensive knowledge of packet core networks architecture. The field is highly competitive, therefore those with an educational background in the field, certifications, and working experience are more likely to advance in the job place. To further increase their value, graduates, and engineers can earn certification with the correct career path roadmap in this sector.

Technical skills set requirements:

- Manage, architect, analyze, and troubleshoot on technical and operation aspect of 5G Core deployment;
- Analyze Network Performance, and optimize Network Architecture;
- Integrates and schematically depicts communication architectures, topologies, hardware, software, transmission, and signaling links and protocol into complete network configurations;
- Plan, Implement, integrate, migrate, perform acceptance tests for Core network areas including CS CORE, PS/EPC, VoLTE, VoWIFI, VoBB, PCRF, SPR, NFV, etc;
- Practical skills in IP Technologies such as MPLS, PBB-TE, MGCP, SIP, RTP, Mobile IP etc;
- Knowledge and expertise on services based architectures, software defined networking, and virtualized communication infrastructure components;

[90] M" A distributed ledger is a digital database that records the transaction of assets where each transaction and its details are stored in multiple places concurrently", Source : Coin Révolution [Online] : https://coinrevolution.com

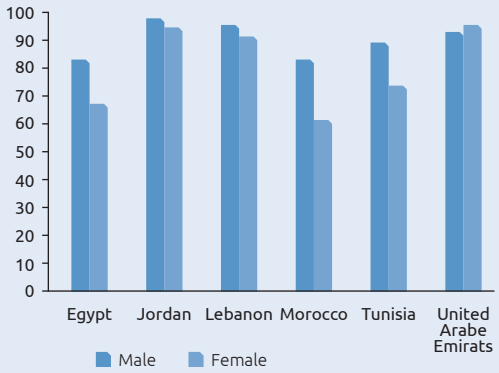
MENA'S CHALLENGES IN ICT : HUAWEI'S EXPERIENCE IN EGYPT

MENA region's common challenges :

MENA countries made significant progress in terms of access and use of ICT. In 2017, OECD published a report[91] saying that MENA governments should prioritize the development of policies that reduce illiteracy – a strong contributing factor to digital exclusion - and bridge digital divides. This would enable citizens to acquire the skills and information required to seize new economic opportunities, move towards higher value-added activities, and become more productive and more favorably integrated into the world economy.

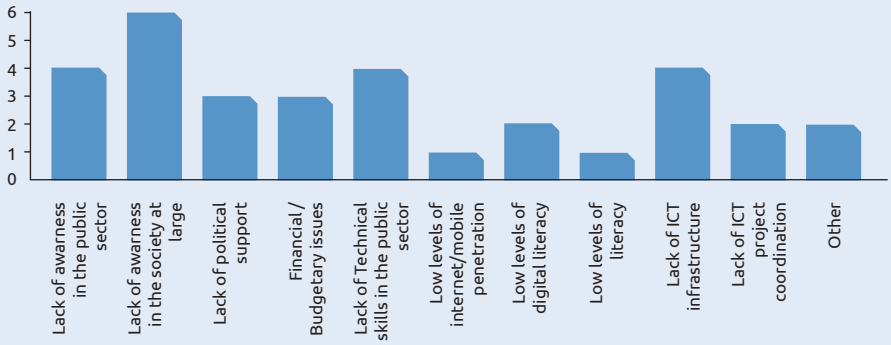
Source: UNESCO (2015), Education dataset, UNESCO, Paris, http://data.uis.unesco.or g/Index.aspx?DataSetCode=EDULIT_DS&popupcustomise=true&lang=en#.

Adult literacy rates (15+)



Government officials identified the main barrier to the implementation of digital government strategies as a lack of awareness of its relevance in the public sector and society at large. Hence, securing political and public support for the digital transformation agenda is a critical factor of success. This may be challenging in a context where political leaders and senior civil servants are often insufficiently familiar with digital technologies, and unable to appropriately assess their strategic value and potential for making the public sector more efficient and effective. The lack of awareness in the broader society is an additional challenge for creating necessary political incentives to drive change. However, this trend is different in the corporate world where nearly 40% of employers in the region indicate that skills gaps are a major obstacle to business growth. Compared to the rest of the world, many countries in the region fall below the global average ease of finding skilled employees[92] .

Main challenges for implementing digital government strategies Number of countries among those benchmarked



Notes: Egypt, Jordan, Lebanon, Morocco, Tunisia and the UAE completed the questionnaire. One questionnaire per country. More than one choice possible.

Notes: Egypt, Jordan, Lebanon, Morocco, Tunisia and the UAE completed the questionnaire. One questionnaire per country. More than one choice possible.
Source: OECD (2015), MENA-OECD Questionnaire on digital government (unpublished dataset).

According to the World Bank, Morocco and Egypt are comparable when it comes to the connectivity Index. The Global System for Mobile Communications (GSMA) Connectivity Index which measures quality of infrastructure, affordability of services and devices, consumers' readiness, and the relevance and availability of local content and services rated Morocco with a score of 58 out 100 and Egypt 56.5[93]. Furthermore, The World Economic Forum believes that 49% of all work activities in Egypt are possibly subject to automation, while this rate is 50% for Morocco[94].

These figures show that MENA countries share common challenges and opportunities.However, significant elements can make

[91] OECD (2017), Benchmarking Digital Government Strategies in MENA Countries, OECD Digital Government Studies, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264268012-en
[92] WORLD ECONOMIC FORUM. The Future of Jobs and Skills in the Middle East and North Africa [Online]. 2017. Available on : http:/weforum.org
[93] WORLD BANK GROUP. Creating Markets in Morocco [Online]. 2019. Available on : https://www.ifc.org
[94] WORLD ECONOMIC FORUM. The Future of Jobs and Skills in the Middle East and North Africa [Online]. 2017. Available on : http:/weforum.org

the difference for the on-going digital development race. And these elements can also be seen on a continental level. In terms of Digital entrepreneurship, for example, four countries (Egypt, Kenya, Nigeria and South Africa,) account for about 60 per cent of Africa's total digital entrepreneurship activity; followed by Ghana, Morocco, Senegal, Tunisia, Uganda and the United Republic of Tanzania, which make up another 20 per cent, while the remaining 44 countries in Africa account for the remaining 20 per cent[95].

Just like Morocco, Egypt's ambition is to become a regional leader in Africa. Therefore, the Egyptian government gives the highest attention to digital transformation and to its capacity building. In its official 2030 vision, 8 out of 77 programs and projects for economic development requires digital talents :

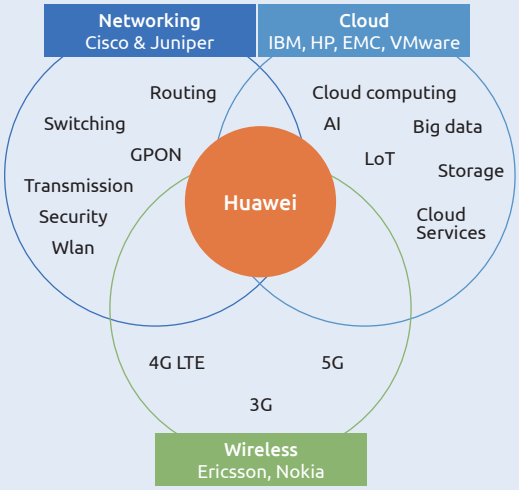
Egypt official 2030 Vision

28. Green economy program.
29. Establishing the Egyptian trade network (Egytrader).
30. Green economy project for sustainable developement.
31. Trade and domestic market empowerment program.

32. Transform Egyptto a global digital hub.
33. National project for high-speed internet.
34. Developing the digital community to enhance efficiency and transparency for all institutions.
35. Establishing technological zones.
36. Deloping cloud computing.
37. Developing information and communication technology industries.
38. Designing and manufacturing electronic products.
39. Promoting entreprneurship.

40. Developing agricultural areas and supporting agro-industry.
41. Establishing collection points and storage facilities for strategic commodities.

Huawei is considered a key partner in this Egyptian journey. Working closely with the government and local stakeholders through Industry-Academia-Government Cooperation Model, the company is a top rated innovator in the 3 domains of Digital Transformation.



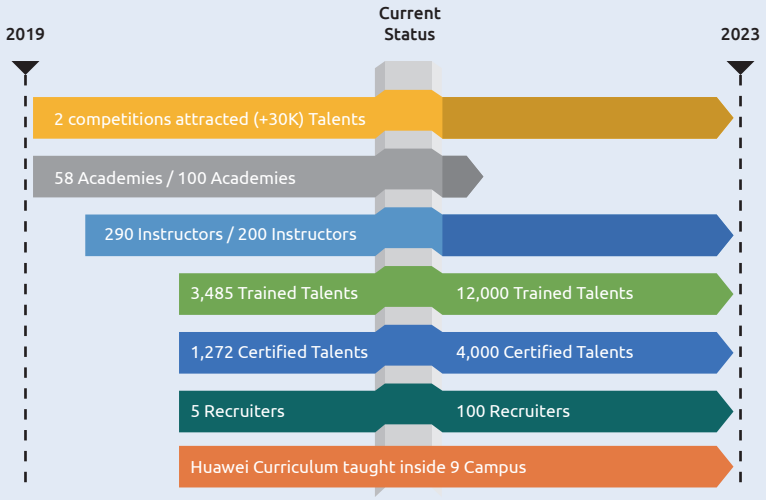
The participation of Huawei to the digital transformation in Egypt includes the following initiatives.

EGYPT iTB talent development program

In order to help Egypt becoming a Digital Transformation talent Hub, Huawei launched in October 2019, the Egypt iTB Talent Development program to create pool of talents, bridge them to innovations & industries.

Huawei's strategy in Egypt is to reach, train and recruit talents[96]. This is implemented through the organization of competitions in Huawei Professionals League (HPL) with filtration exams, build 100 academies, create 10 courses for Egyptian instructors, develop job training and recruit talents through both online, offline job fairs and recruiters from North Africa.

iTB Program Objectives in the coming 5 years:



[95] UN CONFERENCE ON TRADE AND DEVELOPMENT. Digital Economy Report 2019 [Online]. 2019. Available on : https://unctad.org
[96] HUAWEI. ITB to Empower Egypt For a Robust Talent Ecosystem [Online]. 2019. Available on : https://icttalentbank.com

Huawei works closely with national stakeholders and governments, and iTB launched 4 communities to operate the ecosystem:

University Roundtables
Three webinars done

Targets university leaders and academy managers to share success stories within the iTB Program and to discuss the program's progress and achievements

Elites Community
Four webinar done

Targets the top talents with the Vision and Mission of "Building Tomorrow"s future leaders through providing Guidance and Opportunities for Career Development"

Instructors Forum (2 times)
Three webinars done

Targets the experts & instructors of the iTB program to share updates about the program & the certification process

Recruitment union
One webinar done

Targets industries HR to act as a bridge to connect certified Huawei talents with the ICT Industry, under the slogan of "Crafting your Career with Intelligence"

After only one year of existence, the program had reached 190 classes, 3485 trainees and 9800 credit hours. It has delivered 1272 certificates to 887 students.

Huawei Authorized Learning Partner

In March 2020, Huawei signed a Memorandum of Understanding (MoU) of **Huawei Authorized Learning Partner (HALP)** between the MCIT/National Telecommunication Institute (NTI), the training arm for MCIT and Huawei Egypt Technologies. The ceremony was overseen by the Egyptian Minister of Communications and Information Technology (MCIT), Dr. Amr Talaat.

The aim is to accredit NTI as a national center for creating specialized academies in digital transformation and launching the Huawei Professional League (HPL) program for **providing training on digital transformation areas to 10,000 students.** The cooperation scope is not only to launch the **first HIDC Huawei Instructor Development Center in Huawei globally**, but also focus on 10 key functions as follows:

10 Key Functions of MCIT/NTI

1. Train 150 Egyptian instructors.
2. Train top talents for advanced courses.
3. Sponsor Huawei Professional League operation, including but not limited to HPL website.
4. Invest X million EGP as training fees to train Huawei curriculums.
5. Assign 20 class rooms in 10 academies to train Huawei curriculums.
6. Connect Egypt industries to recruit Huawei certified talent.
7. Curriculum Technical Support to Huawei Academies in universities.
8. Host Huawei international exams (like Huawei ICT Competition).
9. Hosting the website, secure its data.
10. Integrate MCIT ressources, and give access to other government entities to support the ITB.

Now NIT HIDC is operating in a satisfactory manner and 20 NTI experts as well as 157 university instructors received the training and is under certification process.

Looking ahead: a new initiative in Morocco

Like in Egypt, Huawei is committed to digital skills development in Morocco. Using the same Industry-Academia-Government Cooperation Model, the company signed a strategic partnership with the Ministry of National Education, Vocational Training, Higher Education and Scientific Research and partnership agreements with 21 universities and education institutions.

Huawei programs in Morocco and Egypt share the same strategic vision, in the way that they can inspire each other from success stories in each country to adapt it to the other country. In the Moroccan context, programs can be created to support youth and rural students and Moroccan instructors' digital skill development.

In 2017, the World Economic Forum published a report about "The Future of Jobs and Skills in the Middle East and North Africa" stating that the Fourth Industrial Revolution will create a wide range of jobs in various fields such as data analysis, computer science and engineering. Countries such as Morocco and Tunisia are expected to see growth in sectors such as automotive, mechanical equipment, electronics and chemicals. The startup scene will increasingly play a fundamental role as a change accelerator and experimental environment. While young entrepreneurs are emerging, accelerator, incubators investment funds, association and corporates are now joining the ecosystem. However, there are still few development programs for startups such as the launch of the Innov Invest fund grants of up to 7,000,000 MAD for startups (US$700,000). ADD also supports a large ecosystem of talented young entrepreneurs and participated to various dedicated funding for startups created by the Moroccan government via the Caisse Centrale de Garantie (CCG) and the Invest Innov Fund in 2017. Still, as we saw in the photography section, our study found that start-ups face major challenges related to bureaucratic and regulatory barriers, as well as a lack of skills much needed for their business growth.

Regardless of sector and occupation new work formats are offering individuals and entrepreneurs new opportunities through online platforms work due to crowdsourcing, remote and virtual work. This represents an opportunity to move people from informal to formal jobs. In Egypt, this could result to 945,000 additional full-time equivalent jobs and a US$21bn increase in Egypt's GDP.

Figure: Emerging professions in MENA, 2011–2016

Profession	Growth, 2011-2016
Entrepreneur	37%
Program Analyst	34%
Quality Assurance Tester	34%
Health and Medical	22%
Business Leadership	21%
Education	19%
Physicit	15%
Technician	13%
Language and Localization Specialit	13%
Nom-profit Board Member	11%
Accounting and Tax	10%
Care and Personal Services	10%
Political and Legislative	9%
Mariner	9%

Profession	Growth, 2011-2016
3D Design	8%
Creative	8%
Public Relations Specialist	7%
Business and Financial Operations	7%
Agriculturist	5%
Travel and Tourism	5%
Information Technology System Administrator	4%
Mechanic and Maintenance Tradesperson	4%
Investment and Banking	3%
Surveyor	2%
Loss preventon Specialist	2%
Journalist	1%
Military Officer	1%

Source: LinkedIn, from WEF report "The Future of Jobs and Skills in the Middle East and North Africa"

If experts agree that most of what is needed is stronger and closer cooperation between governments and private organizations, the report highlights that the education system is the pillar not only to urgently close the region's skills gap today, but also to start building the skills needed to successfully leverage the technological advances of tomorrow.

RECOMMENDATIONS

Covid-19 has impacted life around Morocco and globally for most of 2020. It has also demonstrated the vital role of digital technologies. Even before the pandemic broke out, the digital skills gap existed and demand for digitally skilled talents was high across all levels of emerging digital skills especially at the 'Digital Users' and 'Digital Professional' levels. The main takeaway is that Morocco can benefit from emerging opportunities in the Digital Economy but will need to upgrade its value proposition in ICT based on a clear offering of good quality and agile talents at competitive costs. However, the growing rate of turnover and the lack of highly specialized resources, correlated with an increase in salaries can negatively impact the competitiveness of Morocco in the ICT sector. While upskilling and reskilling using vocational training as the main tool, Morocco will need to target more complex technologies and premium specializations in the value chain to break the current pattern.

As seen in this report, new emerging ICT Technologies are eliminating many manual tasks in many Industries, and IT is no exception. The positive news for the IT sector is that job demand remains strong for those who acquire new-in-demand-skills such as AI Machine Learning Data Analytics and Modelling, Networking Automation, Multi-Cloud Services, Software Development. As IT Network Operations become more automated, as an example network administrators in many organizations will take on roles that align to new-operational-practices, related to management of network policies, lifecycle, and system assurance. Those who had data analytics capabilities to their skills set can fill an emerging role in a way that effectively broadens their contribution and increases the value of the work. Meanwhile, Network Strategy on the other hand will take on high-value roles that target improving business-alignment, integrating of IT processes, improving security, and making better use of data insights. Organization beginning to realize that Cross-Over Roles become more prominent in the future.

Thus, in order to come up with the recommendations listed below, we have based our analysis on the dual approach used for the study, the discussions during the roundtables with key players of the digital environment in Morocco, the Digital Skills Matrix platform results, and international concepts, challenges and recommendations. The following recommendations are classified according to two main categories.

The first one is Direct Recommendations, meaning reform areas that can be identified directly or which can be considered as being on the front burner. The second category includes areas for discussion, where reforms require further policy dialogue, data mining, discussions and consultations with relevant stakeholders in order to build strong public and private policies.

Direct Recommendations

1. Actions to help Students and Workforce:

- Free learning programs for NEET's and low demanded professions to help the conversion to digital professions;
- Incentivize companies to make employment more flexible into easier transition from school-to-work back to school (e.g.: opportunity to register for evening or weekend training courses, allowing them to upgrade their training level to reach better levels of education);
- Remove barriers to nontraditional careers and support new talent pools to encourage gap years that may happen when an employee wants to go back to studies or trainings during his/her career and work-study programs, so that students can benefit from professional experience and concrete cases;
- Recognize the qualifications, certifications, or accreditations to allow the integration of non-traditional profiles;
- Foster and encourage E-Learning and Auto-training wherever possible.

2. Actions to support the Private Sector:

- Establish Industry-Academia-Government Model (IAG) cooperation, with specific job-talent development programs to reskills and upskills organization existing work force both in emerging digital skills and business acumen skills.
- Offer digital talent cultivation incentives program for corporate spending on learning to encourage organizations to devote resources to training
- Develop employer's Guide to Good Training: targeted skills, programs offered and funding;
- Launch priority skills agreements per sector;
- Support and celebrate companies which adapt their recruitment processes to ICT profiles and offer better work environment and conditions;
- Promote business angels to support entrepreneurs in ICT at premature stages of their project and with appropriate tickets, in particular through tax incentives (e.g. tax exemption);
- Engage and follow-up consultations with the private

sector to keep priority skills matching the needs of the digital economy;

■ Incentivize companies to train their employers on priority skills.

■ Organize incentives for corporate spending on Organization Leaderships and Management training in ICT Transformation Solutions that will support their talent pipeline, and business objectives alignment.

3. Actions to reform the education system:

■ Integrate digital skills in teachers' training, continuously upgrade the teachers training, financing teachers training and develop a "digital factory" model in partnership with the private sector;

■ Integrate digital learning from an early age;

■ Generalize short/tailor-made training courses to fill the gap in coders and developers;

■ Introduction of the "VFE" (validation of the field experience) by recognizing employees' professional skills with a diploma or qualification;

■ The academic sector should effectively incorporate Soft Skills as part of the elective courses when designing the ICT programs;

■ Develop the National Digital Skills Framework with the participation of the Industry leaders and Academic Sector to highlights the competency skills and knowledge require for emerging digital job roles with references to the Digital Skills Matrix;

■ Enhance the Digital Double Track Programs with emerging ICT Certification and Training for the Universities and Schools. The Digital Job Skills Matrix provides an added dimension to complement the Morocco National Qualification Framework (NQF) and support critical ICT skills and knowledge competence translation for ICT practitioners and Managers across the Kingdom of Morocco.

4. Actions for public decision makers:

■ Create bridges so that administrations don't work separately;

■ Elaborate digital skills development plans for each government department;

■ Adapt the public procurement selection processes to the profiles of start-ups in the ICT field, through an "Open Innovation" model (e.g. years of experience required, diplomas, referencing, etc.);

■ Update top priority digital skills at national level in order to allow academic institutions to match them. Use Industry-Academia-Government Model (IAG) to increase the participation of Industry leaders with Universities in areas of ICT Curriculum Development and integration, Teacher cultivation programs, and Digital Talent Recruitment Job Placement program;

■ Establish "Tech-Immersion and Placement Program" to converts unemployed individuals and youth from non-ICT background into tech professionals through immersive tech training, and subsequently placing them into relevant tech roles with the support from Industry participants.

■ Establish an 'Advisory Council' to lead discussions and formation on ethical use of AI and data Framework to safeguard and provide guidance to the on the responsible development and deployment of AI in public. The role of the council will engage the private capital community to increase awareness of the need to incorporate ethics considerations in their decisions to invest in businesses which develop or adopt AI in Morocco. The advisory council will also assist the government in developing ethics standards and reference governance frameworks, issue advisory guidelines, practical guidance and codes of practice for voluntary adoption by businesses.

■ Establish a 'National AI Strategy Framework' to identifies and map out key growing business sectors in the medium-to-long term that will help Moroccan experience successful and sustainable AI innovation and adoption. The National AI Strategy Framework will need to call for support from the private and public sectors, as well as international partners and the same time to build-up attraction among the top-tier AI Talent in the region and gobally.

■ Establish a Digital Talent Bank (DTB) as the first step to develop the pipelines of digital roles, skills and knowledge libraries to match the candidates with the industry demands. The adoption of the DTB, will help to match the needs of the Industry demand for skills and competence workforce with the support of the Government and Policy makers;

■ Introduction of a hybrid employee/entrepreneur status for freelancers and start-uppers who provide services to large companies over the long term, in order to ensure agility for companies and security for workers. Strengthen start-ups program with good pool of funding support from Venture Capital (VC) funding increasingly and connection with major innovation hubs in the region to overseas business communities to gain access to talent, capital and partners. Our assessment factors surveyed reflect 3-keys to successful start-up environment –

■ Access to startup resources with effective startup ecosystem,
A startup needs help from many other market participants, such as investors, research institutes, various service providers, accelerators, co-working spaces, and government organizations

■ Access to Skilled Workforce, the skilled workforce does not necessarily have to be local. Forward-looking nations embrace smart immigration policies to attract highly skilled individuals from other countries who can launch and lead innovative industries in STEM and other emerging fields

■ Business Friendly Policies.
Businesses have access to a high-quality workforce, attractive tax regime, efficient and well-maintained

transportation systems, public safety and a well-functioning court system

Areas for Discussion

Technical skills: reverse the actual paradigm

As we have seen in the breakdown of skills offered by the Moroccan Academic Sector, there is an essential issue at the strategic level, the Skills of the future – including 5G skills- are not enough represented, and skills that will serve mature sectors and multinationals are over-represented. On a global level, it is important to correct this imbalance, and to pursue the following course of action:

■ Develop National Digital Skills Framework as a comprehensive Morocco central-information on sector, career pathways, occupation/job roles, as well as existing and emerging Digital knowledge and skills required for job/future job roles set. The National Digital Skills Framework will help to improve and facilitate Digital Skills recognition, integration and further support in the skills and knowledge assessment and design along with Career Path Development. The National ICT Skills Framework will provide use information on:

- Emerging Digital Job Career Pathway
- Existing and Emerging Digital Skills
- Occupation and Job Roles

The target of the National Digital Skills Framework includes Individuals or graduates with passion and interest to further their Digital Career, Employers of Digital Talents, and both public and private Training Providers.

■ Create a National Observatory of Digital Skills, composed of representatives from the Academic Sector, Government, and the private sector, to monitor effectively the Digital Skills Offering by releasing an annual Barometer inspired by the Methodology used to build the Digital Skills Matrix;

■ Strengthen the economic cooperation with Industry leaders, to develop programs to help Technology companies grow in Morocco. Includes connecting the companies to Morocco's startup ecosystem, as well as facilitating the entry of core team members. Such teams include professionals equipped with skills in frontier technology, such as Data Science, Artificial Intelligence, Cybersecurity and Internet of Things. Enable qualifying companies to recruit talents from the core team externally with flexible immigration visa-waivers policies.

■ Update top priority skills at national level in order to allow academic institutions to match them;

■ Incentivize teachers that would work in the unpopular geographic areas and universities;

■ Organize contests and competitions related to priority digital skills applications along with Universities, Industry and Government participation;

■ Change and Optimize curriculum programs to a more flexible and adaptable model that allows to adapt quickly to the ever changing and evolving skills needed for the digital economy.

Soft skills: improve language, foster entrepreneurship and corporate mindset

The Digital Skills Matrix clearly shows that there is a lack of soft skills offered in the programs offered by the Moroccan academic sector, which is coherent with the findings of the survey. In order to address this challenge, the sector should engage in a strategy that would infuse in a transversal manner Soft Skills in the programs, through the following actions:

■ Communication abilities should be enhanced by including more French and English language courses and certifications;

■ Student Associations and team activities should promote team spirit inside the universities, and raise the share of group projects, role-playing, simulations;

■ The Ratio of case studies and project management must be raised to develop problems solving abilities and critical thinking of the students;

■ Mentoring between graduates, students and digital entrepreneurs should become systematic in order to support entrepreneurial mindset;

■ Entrepreneurship spirit and creativity should be supported by creating incubators of new business ideas, encouraging practice and exploration;

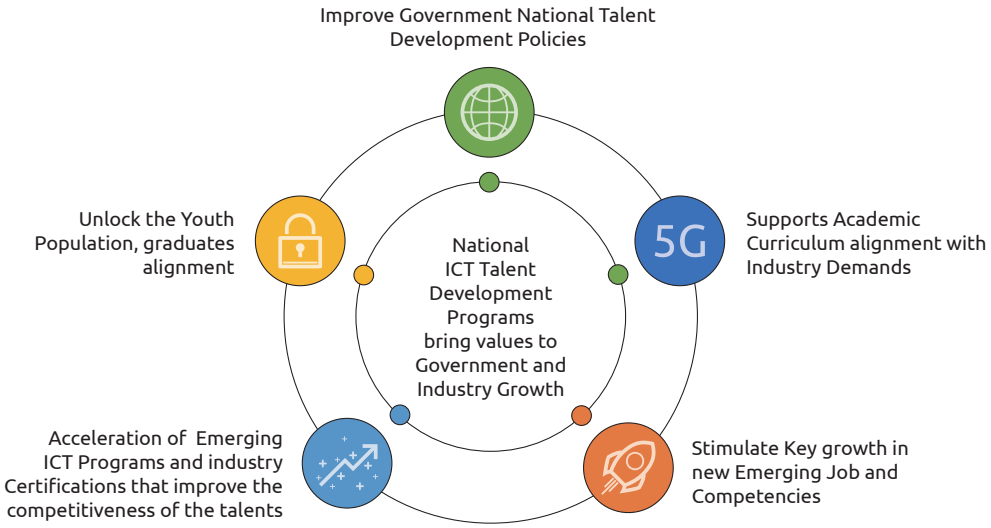
■ The academic sector has to work more closely with startups and companies in the digital field (eg: PPP, training…) in order to strengthen the professional skills of ICT students;

■ Students must get a stronger understanding of the corporate environment before graduation by encouraging the "Alternance" (apprenticeship) and longer training periods;

■ Self-confidence and expression skills of the ICT graduates must be enhanced using self-development activities such as theatre, role playing, artistic activities…

These recommendations are targeted, actionable and would give a push to digital skills development in Morocco. In parallel, there are tools that can push towards the long-term vision of developing Moroccan Digital Economy. The Digital Skills Matrix presented earlier in the report can be implemented and adapted by policy makers as a stepping stone to develop a "National Digital Skills Framework" and the mapping and alignment into the National Qualification Framework. This would include the emerging digital job roles profiles and career path along with the critical skills and competency knowledge. Finally, the establishment of a Digital Talent Bank will help graduates find the first job more easily.

HOW NATIONAL ICT TALENT DEVELOPMENT PROGRAMS BRING VALUES TO THE GOVERNMENTS AND INDUSTRY GROWTH



THE WAY FORWARD

Scrutinizing our study results and listening to main stakeholders, we have found that the strategy is about making more sense of what is already there, integrating what already exists and focusing it more effectively. As one of the participants of our Roundtable concluded: "everything is there (meaning everyone is conscious of the problems and the urgency), we just need to organize ourselves".

Clearly, the study showed that Morocco has to overcome some key challenges in order to align digital skills with industry demands. But the Kingdom also has some strengths, including a favorable demographic dividend, a geostrategic position in terms of technological Foreign Direct Investments, and the rise of a few tech national champions. With regards to the vision, there seems to be a strong consensus of policymakers, which is to create a digital hub between Europe and Africa.

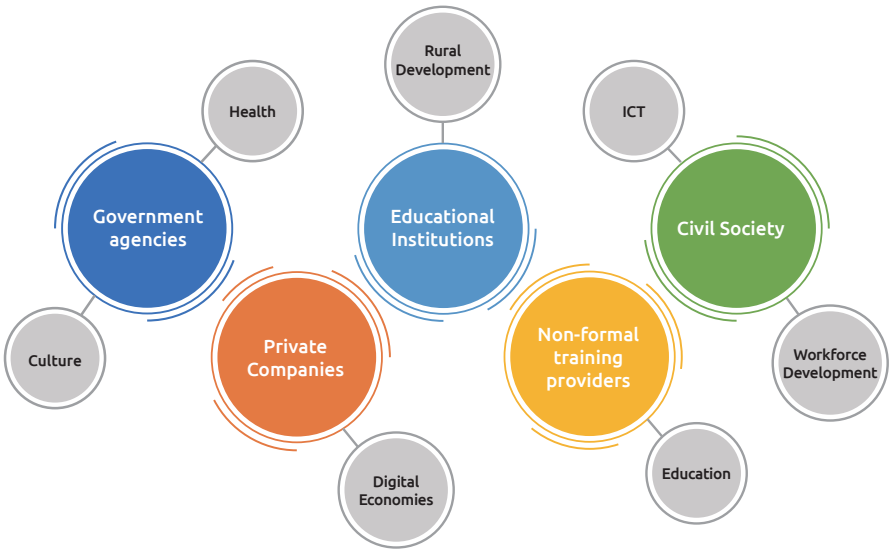
Many of the work needed is about getting together dissipated actions. As OECD recommends, one of the most effective ways to close the gap in digital skills is to create a Digital Skills National representatives council or an action task force. These are effective mechanisms for organizing and sustaining stakeholders in digital skills efforts from strategy development through implementation, review, and updating. Given the cross-sectoral nature of digitalization, countries should adopt a coordinated response to the formulation and implementation of policies to secure benefits from digitalization. A key to a successful strategy and its implementation is thus the engagement of stakeholders from the early stages of strategy and policy development[97].

This is why a Digital Skills Initiative is needed from a strategic level to bring key players with the government to drive the digital skills delivery plan. As digital skills strategies need to be updated regularly to respond to the emergence of new emerging technologies and their impact on the digital economy and digital society. This makes one-size-fits-all policies incompatible with digital challenges. Successful delivery of any strategy will depend on cross-government collaboration, agencies and local organizations and more engagement and communication with companies, private sector representatives and academic institutions. The Industry-Academia-Government Cooperation Model serves as a reference model to many countries, as we have seen in the case study and the results of 'ICT Talent Bank program (iTB)' cooperation between Huawei and Egypt Academic Sector, and Public Government Sector. In Morocco, undoubtfully, ADD could play an important and significant key role, bridging together with other governmental institutions such as the Ministry of education, Ministry of Industry, Trade and Investment and the Digital Economy, OFPPT and AMDIE by cooperating with key academic institutions and private sector representatives and key players to develop and strengthen Digital Talent Ecosystem through The Industry-Academia-Government Cooperation Model.

Figure: Stakeholder engagement: Aiming at building broad representation

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

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



Source: International Telecommunication Union (2018)

At the execution level, several key questions remain unanswered to date, that could be partly resolved following the path described below.

The vision

CRISTALLYZATION

which means to align main stakeholders around the project

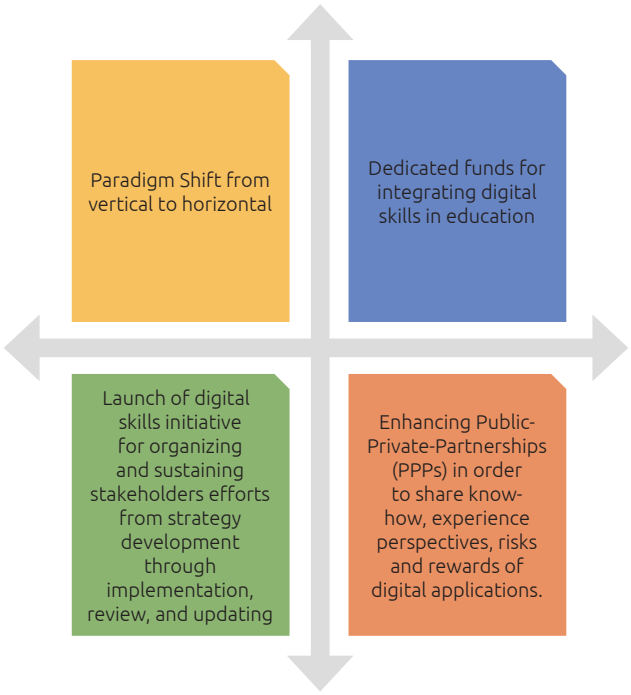
AMBITION

to bring a real added value by narrowing the Digital Talent gaps that will support medium-to-long term Morocco ICT-Ecosystem growth

SIZE MATTERS

the digital skills competition is international so the input and participation of national champions in business and education should be supported in order to promote innovation and to help technology startups to emerge

The implementation of this vision needs the following actions



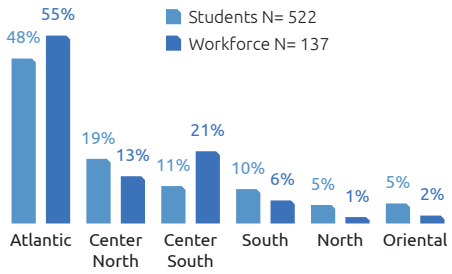
We are pressed on by a civilization change, the fourth industrial revolution put uncertainty as the new normal and digital skills are not an option anymore, they represent a condition for economic growth and social inclusion. Reset imposed by Covid-19 and the ongoing work on the new development model represent a historic opportunity for Morocco to take the bull by the horns and make a shift towards digital economy and become a digital champion in the region.

[97] OECD. Going Digital: Shaping Policies, Improving Lives [Online]. 2019. Available on : https://oecd/org

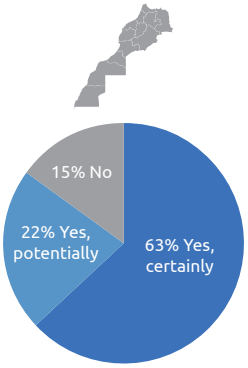
APPENDIX A : SURVEY RESULTS

The market demand is concentrated in few regions, which is forcing the students from the South, North & Oriental regions to relocate

Regions of origins

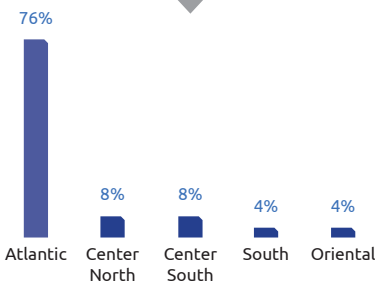


Workers willing to change cities in Morocco for better opportunities
N=137



80%

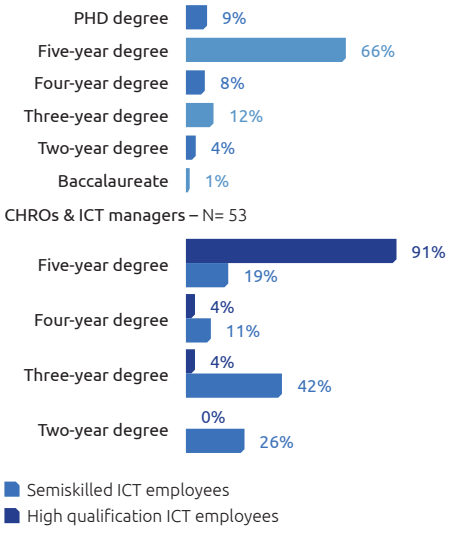
OF CHROS & ICT managers confirm that the best profiles come from specific regions



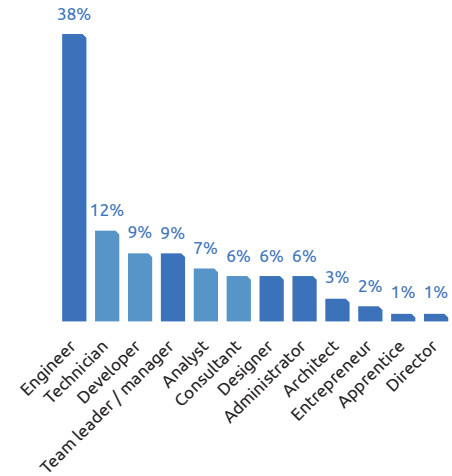
Source: Think One Research & Consulting and Guepard Group – Qualitative study amongst 30 actors and Quantitative study amongst 522 students, 137 employees and 60 CHROs/ICT managers – August & September 2020

The market demand is skewed towards engineering profiles (66% of workers) while companies express demand for technicians

Workforce - Degree
N= 137



Workforce – Position
N=137



Technicians vs. Engineers
CHROs & ICT managers – N=137

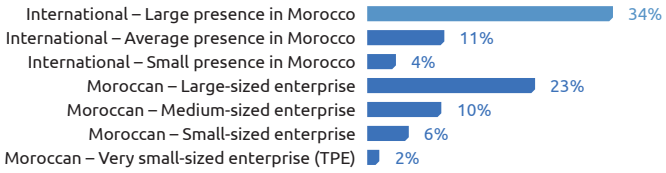
63%

is the average proportion of Semi skilled talents vs. Highly qualified in companies

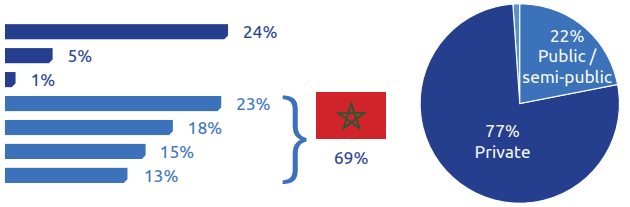
Source: Think One Research & Consulting and Guepard Group – Qualitative study amongst 30 actors and Quantitative study amongst 522 students, 137 employees and 60 CHROs/ICT managers – August & September 2020

Large international companies are student's first choice, but the majority end up working in Moroccan companies & in the Telecom sector

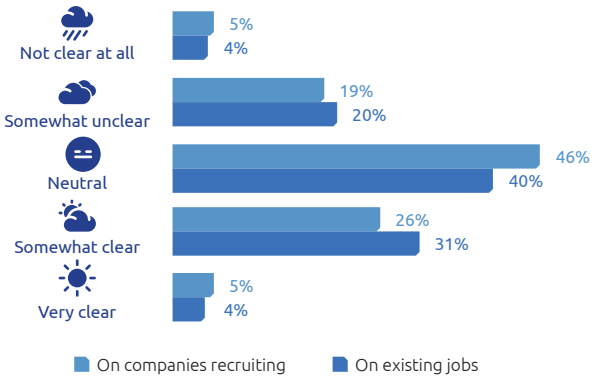
Demand by size of company
N=522



Type of company where workforce is
N=137

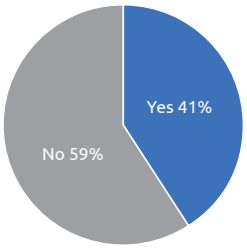


Students visibility
N=522



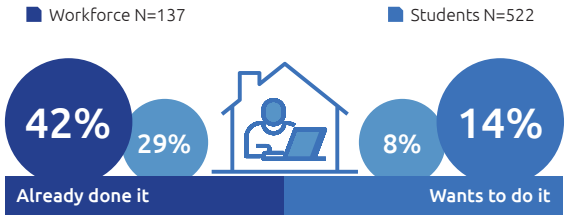
Workforce companies sectors
N=137

Workforce exploration of other sectors than ICT- N=137

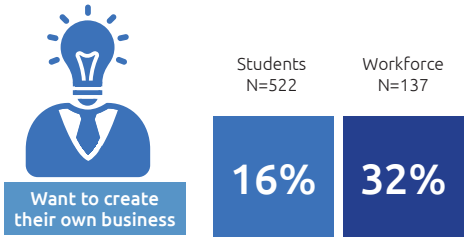


While freelancing doesn't seem fulfilling, aspiration towards entrepreneurship seems high… but opportunities remain very limited

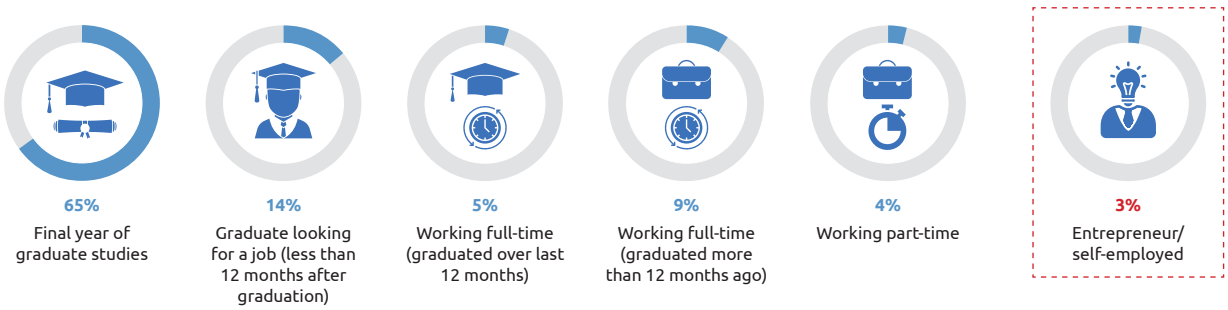
Working as a freelancer



Future professional projects



Professional status
N=659



Source: Think One Research & Consulting and Guepard Group – Qualitative study amongst 30 actors and Quantitative study amongst 522 students, 137 employees and 60 CHROs/ICT managers – August & September 2020

Current educational environment is not encouraging entrepreneurs

The current academic education focuses only on topics directly related to ICT majors

"I receive young ICT talents every day to pitch their projects, but only very few know how to create a business plan, to calculate an ROI or create a company schools only teach them technical classes, it's not enough"

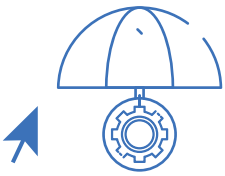
Entrepreneurs don't offer enough personal mentoring to students & graduates

"Existing entrepreneurs should go to schools and identify potential talents, it should be a continuous mentoring and an introduction to their professional network"

The entrepreneurial mindset is missing among ICT graduates

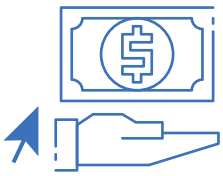
"What we see is that ICT profiles are too much centred on their technology and think they are smart. The problem is that an entrepreneur need to have business sense, the ability to sell the product and motivate teams."

And working in Startups doesn't seem attractive enough



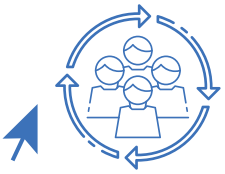
High Risk

"For ICT talents, startups are risky. They prefer to work in large structures or multinationals. They are perceived as unstable"



Low incentives

"Start-ups struggle to offer attractive salaries vs. multinationals except for niche technologies startups"
"Sometimes, they don't pay at the end of the month"



Unstructured HR department

"There is no clear career path and HR support in startups, talents end up demotivated because they're left alone"

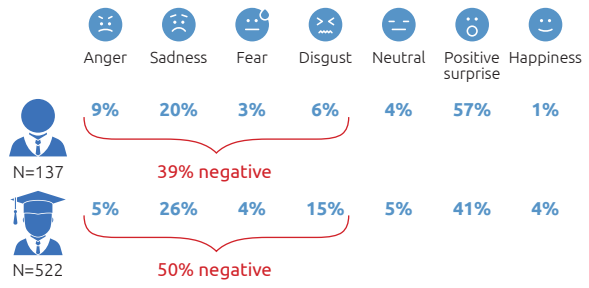
Consequently, startups tend to have a high turnover, and for many of them experienced hires are the only profitable solution vs. training young graduates

Young generations express a negative outlook and pessimistic views on the job market which materializes in a high turnover …

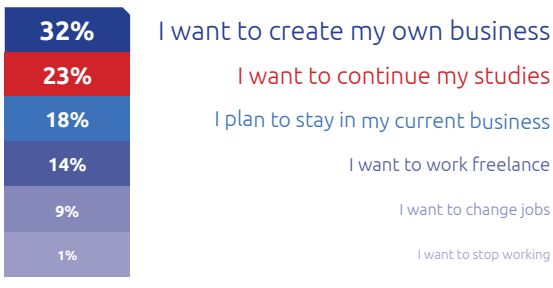
Average time needed to find a job opportunity
N=137

Average turnover according to CHROs & ICT managers
N=51

Feeling towards the ICT job market



Workforce future professional projects
N=137

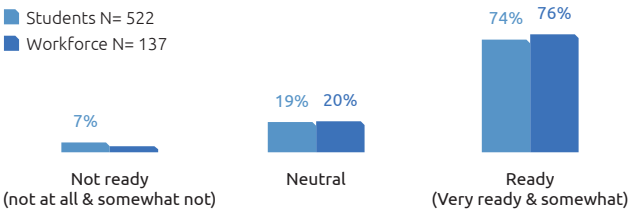


Source: Think One Research & Consulting and Guepard Group – Qualitative study amongst 30 actors and Quantitative study amongst 522 students, 137 employees and 60 CHROs/ICT managers – August & September 2020

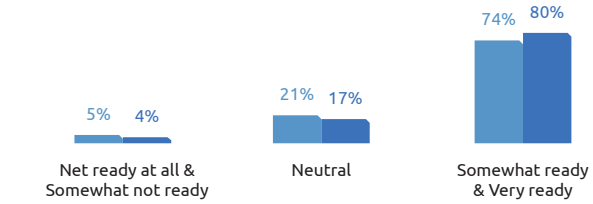
Young generations are not aware of their soft skills gaps

Feeling of preparation in terms of skills

Soft skills and linguistic skills

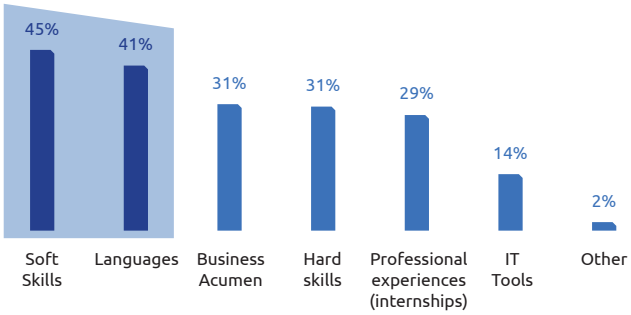


Hard skills



Top 3 soft skills targeted by CHROs
CHROs & ICT managers – N+49

Top 2 subjects to be reinforced within academic programs
CHROs & ICT managers – N+49



There are also structural drawbacks at the educationalists' level

Early Education

Lack of skilled teachers who can use **ICT tools** correctly

Some teachers refuse to **change** their **teaching methods** to include **digital tools**

Some professors are not **passionate** about their jobs, they have chosen this job by elimination

Professors are demotivated because they have **low salaries** vs. other jobs, while successful countries in education pay the highest salaries to the educational staff

Higher Education

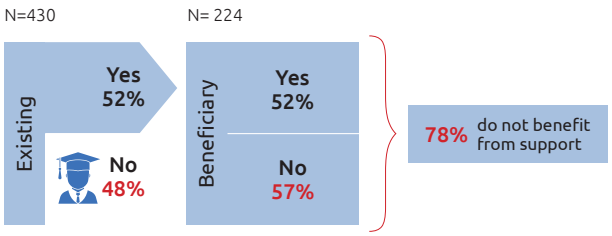
Limited experience and interactions with the **ICT professional market** and the **entrepreneurial ecosystem**

Lack of **trainings** and **concrete research work** (nationally and internationally)

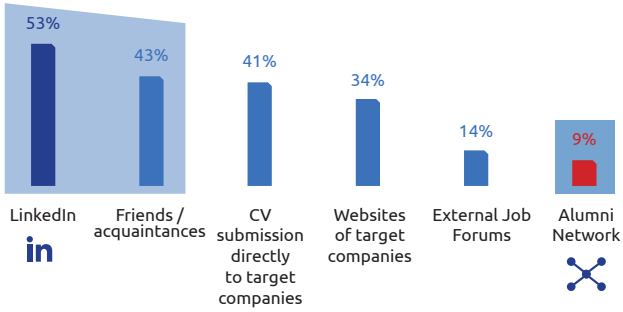
Source: Think One Research & Consulting and Guepard Group – Qualitative study amongst 30 actors and Quantitative study amongst 522 students, 137 employees and 60 CHROs/ICT managers – August & September 2020

Academic establishments programs fail to integrate students into the corporate world

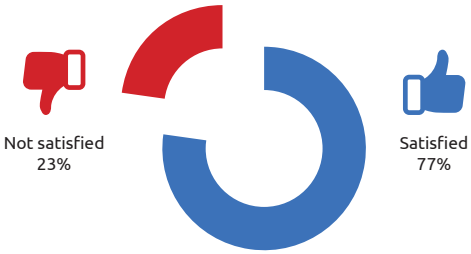
Support provided by establishment to find internship/work
N=430



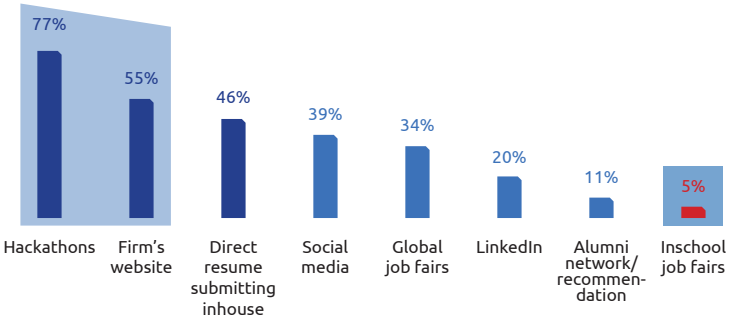
Means used to find internships in ICT
N=430



Satisfaction with internships / work placements organized by the institution
N=96



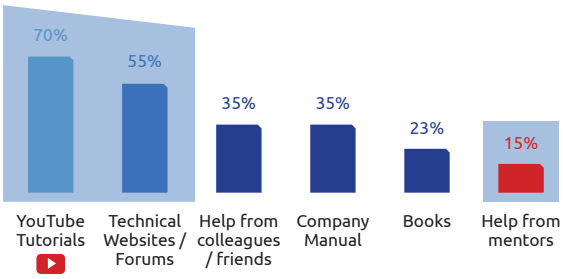
Most used job search channels for ICT
CHROs & ICT managers – N=53



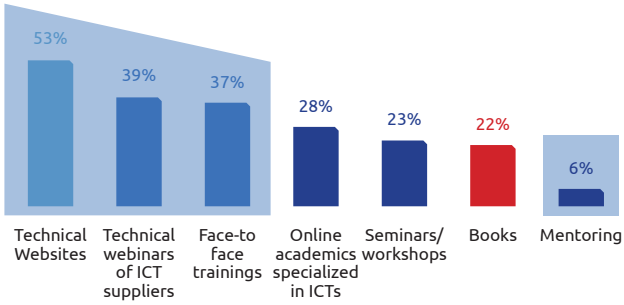
Source: Think One Research & Consulting and Guepard Group – Qualitative study amongst 30 actors and Quantitative study amongst 522 students, 137 employees and 60 CHROs/ICT managers – August & September 2020

Once students integrate the corporate world, the lack of strong internal trainings and mentoring programs penalizes their growth

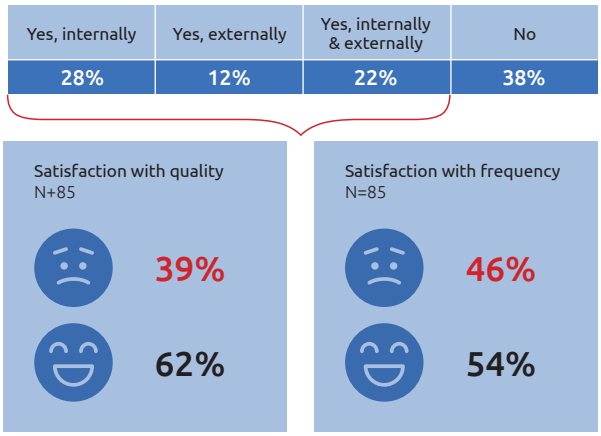
Tools for solving the challenges related to ICT
Workforce – N=137



Maintenance of up-to-date ICT technical certifications
Workforce – N= 137



Means used to find internships in ICT
N=430



Source: Think One Research & Consulting and Guepard Group – Qualitative study amongst 30 actors and Quantitative study amongst 522 students, 137 employees and 60 CHROs/ICT managers – August & September 2020

Many companies admit not offering sufficient training programs and career & skills performance tracking

Many companies are not offering internal training programs to their employees

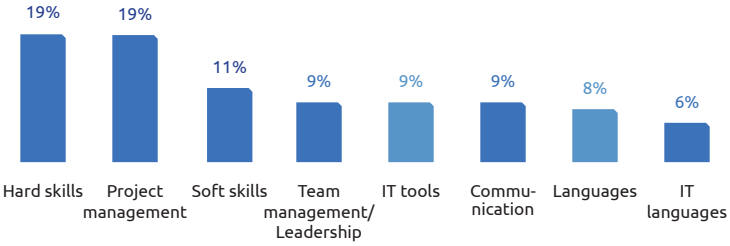
CHROs & ICT managers – N= 53

34%

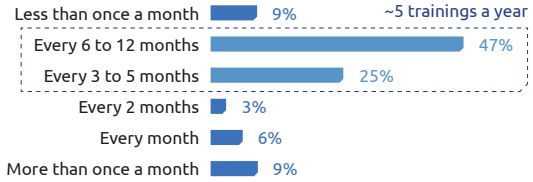
Of CHRO's assert the unavailability of the training programs

ICT subjects are very lightly covered during the trainings programmed by the compagnies.

Subjects coverd in the trainings
CHROs & ICT managers – N= 53



Frequency of trainings
CHROs & ICT managers – N= 53



34% Of companies HR departments do not track employees career path and skills competency performance

56% Is the average percentage of ICT employees that will be upskilled and promoted within 2 to 5 years to meet the organization's business objectives

The education system is too traditional and needs more flexibility in order to be more efficient

Orientation

Create an orientation system that allows students to better understand the range of possibilities in terms of monetizing their academic career

Selection

Improve the student selection process by integrating the automation of entrance tests on the basis of dedicated solutions

"For the 1337 we use an algorithm that allows us to accurately and objectively select 600 passionate students out of the 16,000 applicants, through a 1-month competition"

Model

Review the traditional studies of state engineer which are not necessarily adapted to ICTs, the criteria are very selective

"We are missing out on talents who may have failed the BAC but who can be excellent coders"

Duration

Generalize short/tailor-made training courses to fill the gap in coders and developers, without having to go through the engineer box

"There is a potential to train profiles who are looking for themselves, who have no diplomas or just DEUG"

Methodology

Teaching ICT in project mode (with a problem and solutions) to stimulate more the spirit of innovation and give more meaning to the digital profession

Practice

Encourage gap years and work-study programs, so that students can benefit from experience and concrete cases

'There is no work-study system in Morocco, it is a solution that can solve a large number of problems"

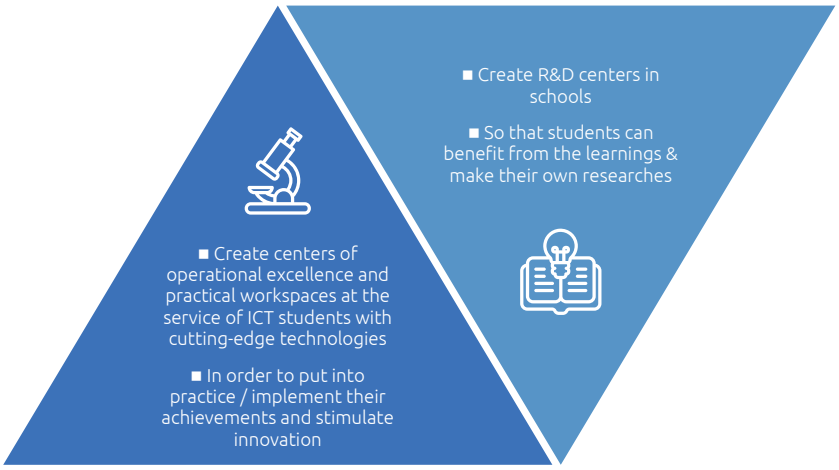
Practice

Possibility of considering the introduction of the 'VAE' (validation of the field experience by recognizing employees professional skills with a diploma or qualification) in Morocco

In order to encourage the training by projects while giving the possibility to highlight years of experience in university training

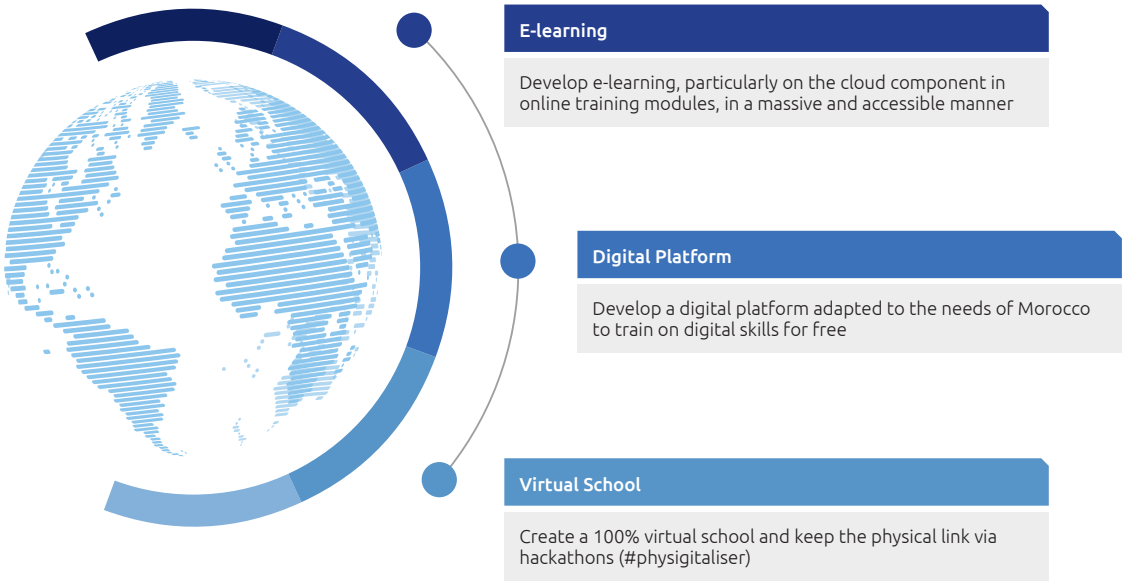
Source: Think One Research & Consulting and Guepard Group – Qualitative study amongst 30 actors and Quantitative study amongst 522 students, 137 employees and 60 CHROs/ICT managers – August & September 2020

An infrastructure is needed for the learning by doing, an important component of the ICT training



"It's learning by doing, we have launched a data center at UM6P in partnership with IBM, which is freely accessible to our students to design robots, software, etc. "

A "Soft infrastructure" can be developed to help students get educated remotely



Recruiters need to adapt their recruitment processes to ICT profiles and offer better work environment and conditions

Reintegration & development

■ Develop a strategy for the reintegration of specialized profiles in areas in low demand in Morocco (particularly scientific ones) towards ICT professions

Create collaborations with universities to give BAC+3 employees the opportunity to register for evening or weekend training courses, allowing them to upgrade their training level to reach better levels of education

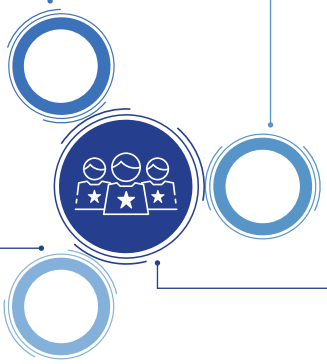
Management

■ Develop the "employer brand" and improve communication with generations Y, Z and Alpha by moving towards a more horizontal management

■ Rationalize the salaries of ICT profiles through limitation of freelancers recruitment for long periods within companies, in order to stop the wage bubble.

■ Develop incentive programs to ensure better turnover (e.g: with stock options)

■ Create the possibility for employees to work on innovation / development projects up to 20% of their time in the company



Recruitment

■ Recruit on the basis of motivation / soft skills and not only on grades

■ Create a recruitment forum dedicated to international executives in order to attract executives to positions of responsibility in Morocco

"My best element is self-taught and I am myself in the same case (I did not even have the BAC) , and I ended up doing training at Harvard, is show that passion is the main driver"

Incentives

■ Promote business angels to support entrepreneurs in ICT at premature stages of their project and with appropriate tickets, in particular through tax incentives (e.g. tax exemption)

■ Develop a regulatory process to limit the leakage of profiles recently trained on cutting-edge technologies to the benefit of other companies

■ Incentivize companies to recruit and train young people

APPENDIX B : SURVEYED ORGANISATIONS

- Ministry of Industry, Trade, Green and Digital Economy
- Ministry of National Education, Vocational Training, Higher education and Scientific Research
- Ministry of Youth and Sports
- National Telecommunications Regulatory Agency (ANRT)
- The Agency of Digital Development (ADD)
- Royal Institute for Strategic Studies (IRES)
- Association of information Technology Professionals (APEBI)
- Morocco's Investment and Trade Agency (AMDIE)
- The General Confederation of Moroccan Companies (CGEM)
- National Agency for Promotion of Employment and Skills (ANAPEC)
- Mohammed VI Polytechnic University (UM6P)
- EUROMED University
- ISGA group
- School of Information Sciences (ESI)
- National School of Applied Sciences (ENSA)
- Université Mohammed VI Polytechnique (UM6P)
- National Institute of Posts and Telecommunications (INPT)
- Cadi Ayyad University
- 1337 New Generation Coding School TIC experts
- WEF Global Shapers
- Red TIC
- European Securities and Markets Authority (AEMF)

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2021

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