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Digital Transformations and Economic Diversification in Central Africa: Issues, Challenges and Opportunities

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"DIGITAL TRANSFORMATIONS AND ECONOMIC DIVERSIFICATION IN CENTRAL AFRICA: ISSUES, CHALLENGES AND OPPORTUNITIES"

PRELIMINARY REPORT

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1. INTRODUCTION

1. Experts are increasingly unanimous in asserting that information and communication technologies (ICTs) are becoming more and more important in the societies of the twenty-first century. The digital transformation led by ICTs has indeed contributed to economic growth, direct and indirect job creation, human resources development, and institutional strengthening, among others. In the specific case of Central Africa, this study aims at identifying and analysing the ways and means to better harness the opportunities offered by the digital transformation to accelerate the economic diversification and industrialization process, and thus enter the fourth industrial revolution era. Such is the scope of this study that the Central Africa Office of the United Nations Economic Commission for Africa (ECA/SRO-CA) decided to carry out for the benefit of its member States.

1.1 Background of the study

2. Africa is the continent with the fastest population growth (an annual growth rate of 2.5% compared with 1.12% globally) and a high proportion of youth. Indeed, according to The Deloitte "Consumer Review Africa : a 21st century view[1]", more than 200 million Africans, i.e. more than 20% of the total youth population, are between the ages of 15 and 24. The report specified that this figure is expected to increase to 321 million by 2030 and that young Africans, i.e. a good part of the emerging middle class, will aspire to a greater choice of products and services, as well as greater connectivity. Africa should become the second largest market for investment by European consumer goods companies.

3. This trend is more evident in the area of ICTs. In fact, Sub-Saharan Africa has the highest mobile telecommunications growth rate in the world, with an annual compound rate (CAGR) of 6.1%, according to the 2017 GSMA report on the Sub-Saharan Africa mobile sector economy,[2] and this trend is expected to continue for many more years. Moreover, few African countries have innovated and are becoming leaders in specific areas, like Kenya with respect to mobile finance with more than 2.5 million transactions per day, allowing better legibility and traceability of such transactions, greater access to financial services and increased transparency, among others. In addition, Africa has the highest growth rate in the number of online B2C consumers over the period 2013-2018, i.e. 82% compared with a global average of 50% over the same period,[3] even though the percentage of the population that made an online purchase is still one of the lowest at 7.1%. Such fast development of ICTs is likely to contribute to the achievement of the SDGs, as stated by Houlin Zhao, ITU Secretary General: *"ICTs offer unique opportunities to accelerate progress towards the SDGs and radically improve people's lives".*[4]

[1] https://www2.deloitte.com/content/dam/Deloitte/ng/Documents/consumer-business/the-deloitte-consumer-review-africa-a-21st-century-view.pdf
[2] https://www.gsmaintelligence.com/research/?file=0c798a6a56bdb31d4bc3b4ff4a35098d&download
[3] UNCTAD (2015) "Information Economy Report: Unlocking the Potential of E-commerce for Developing Countries" at: https://unctad.org/en/PublicationsLibrary/ier2015overview_en.pdf
[4] How ICTs are accelerating the SDGs, ITU Magazine No. 3/2017. https://www.itu.int/en/itunews/Documents/2017/2017-03/2017_ITUNews03-en.pdf

4. In Central Africa, several countries are affected by the collapse of prices of major commodities, including oil, and are facing significant macroeconomic imbalances marked by a decline in economic growth. During the 33rd session of the Central African Intergovernmental Committee of Experts (CIE) held in 2017 in Douala, through the **Douala Consensus,** a call for action was made for major players in the public and private sectors to move from a vicious circle of unprocessed raw material exports to a virtuous circle of adding value to resources through rapid diversification and industrialization.

How can Internet become a public good?

5. Digital transformation is a key pillar of economic diversification and industrialization strategies. By taking the example of e-commerce, which relies on the logistics chain for its development, it appears that the sub-regional integration or the African Continental Free Trade Area (ACFTA) are favorable frameworks for the development of the digital economy. The advent of the ACFTA is one of the priorities of Agenda 2063 for Africa with digital technology, which can play a catalytic role.

6. Seeking to operationalize the Douala Consensus, the 35th session of ICE focuses on the theme "Digital Transformations and Economic Diversification in Central Africa: Issues, Challenges and Opportunities.

1.2 Objectives of the study

Main objective:

7. This report aims at identifying the ways and means to harness digital transformation for economic diversification and the creation of new opportunities for growth and employment in Central Africa.

Specific objectives:

8. More specifically, it aims at:

- Assessing the state of the digital economy in Central Africa;

- Analysing the drivers as well as the obstacles to its expansion and contribution to economic diversification and industrialization as well as regional integration within the context of the African Continental Free Trade Area (ACFTA);

- Formulating recommendations for actions to be implemented by Member States, regional economic communities, international organizations, the private sector, universities and donors.

1.3 Methodology, structure and limits of the study

9. The methodology adopted to undertake the study includes mainly reliance on desk research and secondary data available in national, sub-regional, regional and international organizations specialized in the field. The indicators used are those adopted by ITU or UNCTAD given their respective mandates. The report benefitted from a constant interaction between the consultant and the experts of ECA's SRO-CA.

10. After a presenting the main digital economy trends at global and regional levels, the current situation of the digital economy in Central Africa is drawn up in order to have a good knowledge of the state of art. An analysis of the existing situation combined with the general trends will make it possible to identify the opportunities and challenges for the acceleration of economic diversification and industrialization in the sub-region, from which the conclusions and recommendations of this report will be drawn.

11. The report highlights that the digital economy is growing rapidly, whether with regard to ICT goods and services or ICT- based goods and services, and this is reflected in the growth observed in their penetration rate as well as in the importance of related enterprises in national economies. Digital technologies improve the efficiency and productivity of businesses, administrations and organizations that undertook their digital transformation, while at the same time facilitating inclusion. They bring profound changes in production, marketing and the organization of work and have allowed the emergence of new disruptive business models. They allow job creation, but also job destruction.

12. This general trend, which makes the digital technology a catalyst for economic development, also applies to Central Africa. Based on their comparative and dynamic advantages , and relying on a population with a high proportion of young people, the countries of ECCAS, depending on their particularity, have, in this report, would find in this report possible solutions to move to more diversified economies and a new stage of their industrialization process based on the use and development of digital tools.

13. This process of digital-based economic diversification for the creation of value and wealth can only be effective if the weaknesses faced to prepare this report could be addressed. Chief among them are the limited availability of data and studies on the dynamics of the digital transformation in the sub region; few policy and strategic level documents; and weak monitoring and evaluation mechanisms. All these elements, if available, could have helped better assess the progress made with their respective mechanisms and tools, the lessons learned with successes and failures as well as the role of the private sector and universities, added to the one played by foreign investors.

2. MAJOR TRENDS IN THE DIGITAL ECONOMY AT THE GLOBAL AND REGIONAL LEVEL

2.1 About the digital economy

14. The digital economy is globally recognized as a vehicle for growth as well as for the productivity and competitiveness of companies, organizations and countries. Thanks to its transversal nature, it impacts all areas of life as well as all economic sectors. It is important to define this concept and all related ones in order to limit the scope of its use thereafter. **A list of the terms used in this report with their definitions is included in Annex 1.**

15. Definition of the digital economy: There is no universally recognized definition. According to the 2017 UNCTAD report on the information economy[5], the digital economy is

[5] https://unctad.org/en/PublicationsLibrary/ier2017_en.pdf

characterized by its scope, which can be narrow or broad. The narrow scope relates to the telematics production sector, and encompasses various digital services (for example, outsourced call centre services) and platform economy services (for example, Facebook and Google). The broad scope includes the use of various digital technologies for performing activities, such as those conducted in the e-business sectors, e-commerce, automation and artificial intelligence. This definition is illustrated by the figure below.

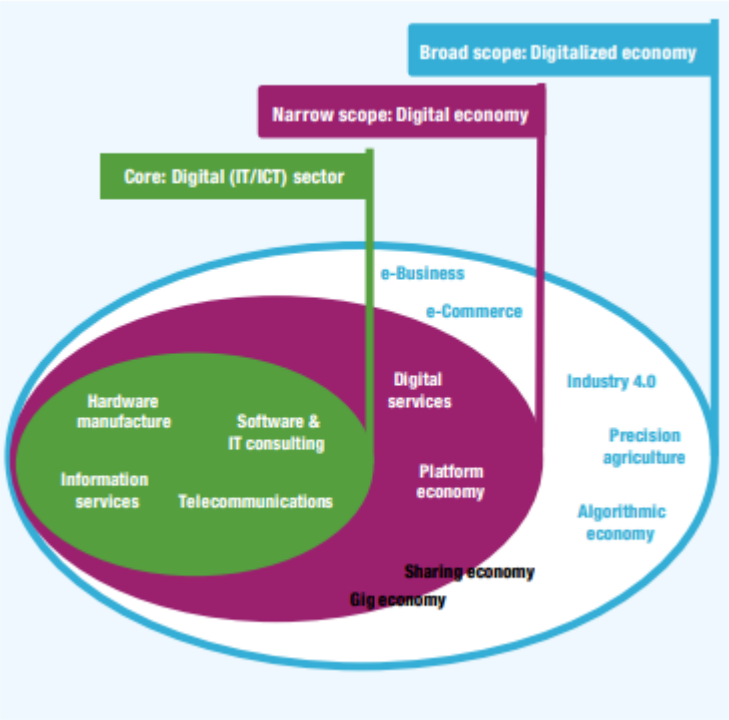


Figure 1: **Representation of the digital economy**
Source: UNCTAD 2017 Information Economy Report[6]

16. Still according to UNCTAD and from the 2017 World Investment Report "*Investment and the Digital Economy*",[7] the digital economy is the application of internet-based digital technologies to the production and trade of goods and services. The production and trade in goods and services are subdivided into two: the production and trade of ICT goods and services, and the production and trade of ICT-based goods and services.

Box 1: Definition of the digital economy as contained in the "Digital Cameroon 2020 Strategic Plan"

The digital economy has three dimensions. The first, which is described as the heart of the digital economy, is based in particular on the development of fixed and mobile broadband electronic communications infrastructures and the development of the computer and electronics sectors.

The second dimension is the so-called new economy activities, which are ICT-related activities that stem directly from the existence of the digital heart, i.e. broadband infrastructures and the Internet. Online service platforms are part of this dimension.

The third dimension concerns the transformation of existing business sectors, organizations, structures and uses by integrating ICT into production processes and customer relationship management (e-commerce, e-health, e -Education, e-Administration, ...). This is where we talk about digital transformation.

17. The figure below gives a composition of the digital economy, which also helps to get a deeper understanding of this concept. The illustration in three concentric circles has a clear similarity to the three-dimensional definition in the box above.

[6] Idem
[7] https://unctad.org/fr/PublicationsLibrary/wir2017_overview_fr.pdf

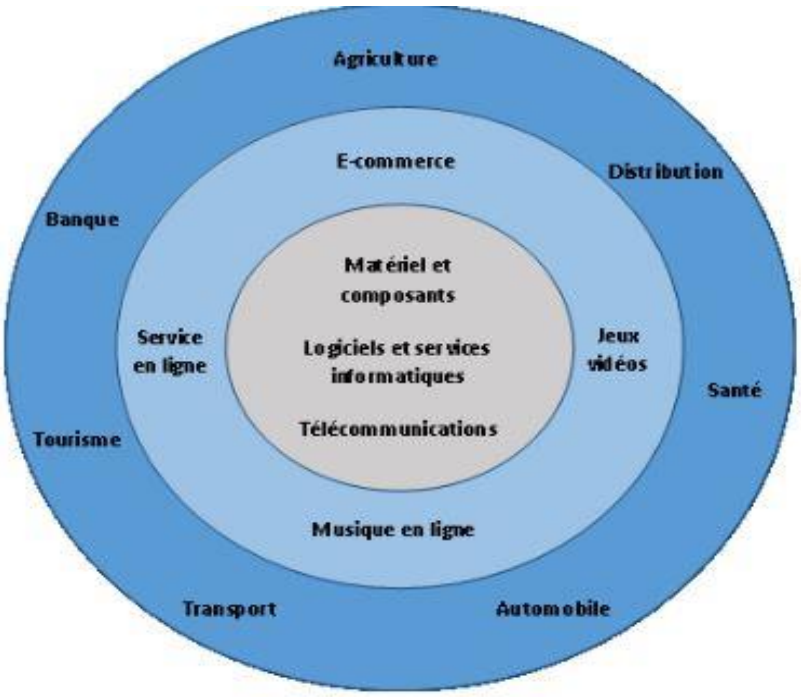


Figure 2: Composition of the digital economy
Source: "*Impact of the digital economy, Sociétal review No.1, 2011".*

18. Within the United Nations system, the vision for the development of the digital economy at global level is driven by the Commission "*Broadband for Sustainable Development"*, created in May 2010, which includes the International Telecommunication Union (ITU), the United Nations Educational, Scientific and Cultural Organization (UNESCO) and senior leaders from the public and private sectors, as well as from international organizations and organizations working for development. The Commission's vision is to "connect the other half", since about 50% of the world's population is already connected to the Internet.

Box 2: The seven targets of the "*Broadband for Sustainable Development*" Commission's 2025 Vision

- ✓ By 2025, all countries should have a funded national broadband plan or strategy or include broadband in their definitions of universal access/services.
- ✓ By 2025, entry-level broadband services should be made affordable in developing countries, at less than 2% of monthly gross national income per capita.
- ✓ By 2025, broadband-Internet user penetration should reach:
  - 75% worldwide
  - 65% in developing countries
  - 35% in least developed countries
- ✓ By 2025, 60% of youth and adults should have achieved at least a minimum level of proficiency in sustainable digital skills.
- ✓ By 2025, 40% of the world's population should be using digital financial services.
- ✓ By 2025, the lack of connectivity of Microenterprises, Small and Medium-sized Enterprises should be reduced by half.
- ✓ By 2025, gender equality should be achieved across all targets.

Source: "*Broadband for sustainable development"* Commission"[8]

[8] https://broadbandcommission.org/Documents/ publications/wef2018.pdf

19. In 2018, the International Telecommunication Union (ITU), which is the United Nations specialized organization in the field of information and communication technologies (ICTs), defined its vision for **"an information society** based on an **interconnected world**, where **telecommunications/information and communication technologies** enable and accelerate **environmentally** sustainable **growth** and **socioeconomic development** for all".

20. In the framework of the United Nations 2030 Agenda, where the international community set itself 17 Sustainable Development Goals (SDGs), several studies have highlighted the crucial role of digital technologies in achieving the SDGs. Also, according to the 2017 UNCTAD *Information Economy Report*,[9] ICTs, e-commerce and other digital applications can be leveraged to promote entrepreneurship, including the empowerment of women as entrepreneurs and traders (SDG5, Target b), productive activities, creativity, innovation and decent job creation. They can also stimulate the growth of microenterprises, small- and medium-sized enterprises (MSMEs) and facilitate their integration into the formal sector, including through access to ICT-based financial services (SDG 8, Target 3). Digital solutions can be used to facilitate the access of MSMEs in developing countries to financial services (online and mobile payments) and markets (for instance, by using the opportunities offered by virtual markets), as well as to enable their integration into value chains (SDG 9, Target 3). In addition, e-commerce will play an increasingly important role in achieving SDG 17, Target 11 - increase the exports of developing countries and double the least developed countries' share in global exports by 2020 (See Annex 2).

21. According to *the web dictionary*,[10] digital transformation refers to the process of an organization's full integration of digital technologies into all its activities. Thus, digital transformation is a continuous process that consists in automating, through ICTs, internal processes (production, human resources, administration and finance), the use of ICTs for the dematerialization of customer relationship management and disintermediation, and the reinvention of the economic model to stand out from competitors and have a competitive advantage. The digital transformation of businesses and organizations has become a key issue. In fact, according to a recent McKinsey study entitled "Accelerating the digital transformation of French businesses : A source of growth and competitiveness for France"[11], companies that are successful in their digital transformation have a potential gross increase in their operating income of 40% while those that fail to adapt to the digital are at risk of seeing their operating income fall by 20%. The results of this study, extrapolated in the African context where digital bridging is weaker, suggest a greater risk for companies in their process of digital transformation.

22. Digital transformation is thus, and very often, disruptive. For example, the platforms for managing urban mobility, finance (Fintech), insurance (Insurtech) or social networks offering traditional telecommunications services (OTT-Over the Top) have not only integrated ICTs in their entire process, but they have innovated by putting in place an economic model allowing them to be ahead of competitors already on the market. Digital transformation, as indicated above, can therefore not be limited to digitizing the previously used processes and tools to do the

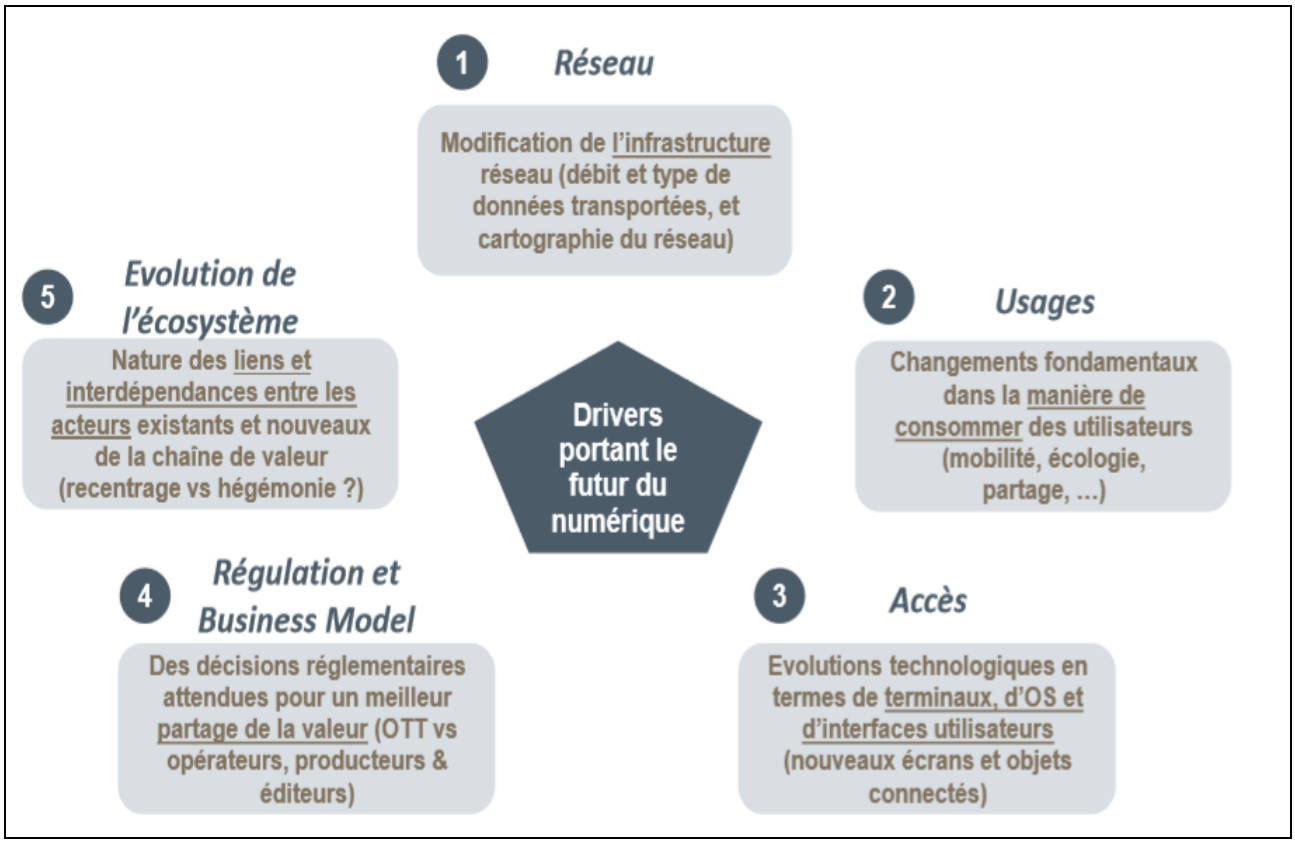
[9] https://unctad.org/en/PublicationsLibrary/ier2017_en.pdf
[10] https://www.1min30.com/dictionnaire-du-web/transformation-digitale-numerique
[11] https://www.mckinsey.com/~/media/McKinsey/Locations/Europe%20and%20Middle%20East/France/Our%20Insights/Accelerer%20la%20mutation%20numerique%20des%20entreprises/Rapport_Accelerer_la_mutation_numerique_des_entreprises.ashx

same thing that was done before. It is a matter of re-optimizing the entire production system, offers and customer relations taking into account ICTs.

23. In general, and increasingly, the information society is associated with what can be referred to as the 4th industrial revolution or "Industry 4.0". In an interconnected world, which will be even more so with the advent of the 5G mobile technology, with more telecommunications subscriptions than humans on the planet, more and more connected objects (Internet of Things), gigantic volumes of data (Big Data) concerning everything (individuals, organizations, equipment, education or health services, etc.) will be exchanged and processed using artificial intelligence (AI). AI is the basis of so-called intelligent systems which have given rise to major innovations such as the autonomous car, voice recognition or intelligent vision. The importance of data in the digital economy is such that they are called new "black gold" in comparison with the role previously played by hydrocarbons in the economy.

24. It is quite appropriate to examine the factors underlying the continuous progress in the development of the digital economy, namely the drivers. According to the Mawensi Partners' firm report entitled *"Le Regard: Analysis of the digital economy drivers",*[12] the digital economy of tomorrow is driven by five drivers: the network, the uses, the access, the regulation and the business model, and the evolution of the ecosystem. These five drivers are interdependent through a virtuous process that makes the development of one to lead that of others.

Figure 3: The five drivers of the digital economy



Source: *Le Regard, Mawensi Partners, 2013*

[12] https://www.mawenzi-partners.com/publication/Le-Regard-Mawenzi-Partners--5---Drivers-du-num--rique.pdf

25. Services and uses (e-health, e-education, e-gov, e-security, e-finance, etc.) are developing thanks to the innovations of AI, which is becoming a major research & development issue of this 21st century, as space research was, for instance. It is so important that the G7 ICT and Innovation Ministers, at their meeting in 2017, adopted a statement on AI in which they expressed a vision of AI focused on the human and driven by innovation and economic growth and committed to investing in basic R & D and early applied R & D to produce AI innovations and support AI entrepreneurship.

2.2 The digital economy at the global level

2.2.1 The digital economy ecosystem and its economic impact

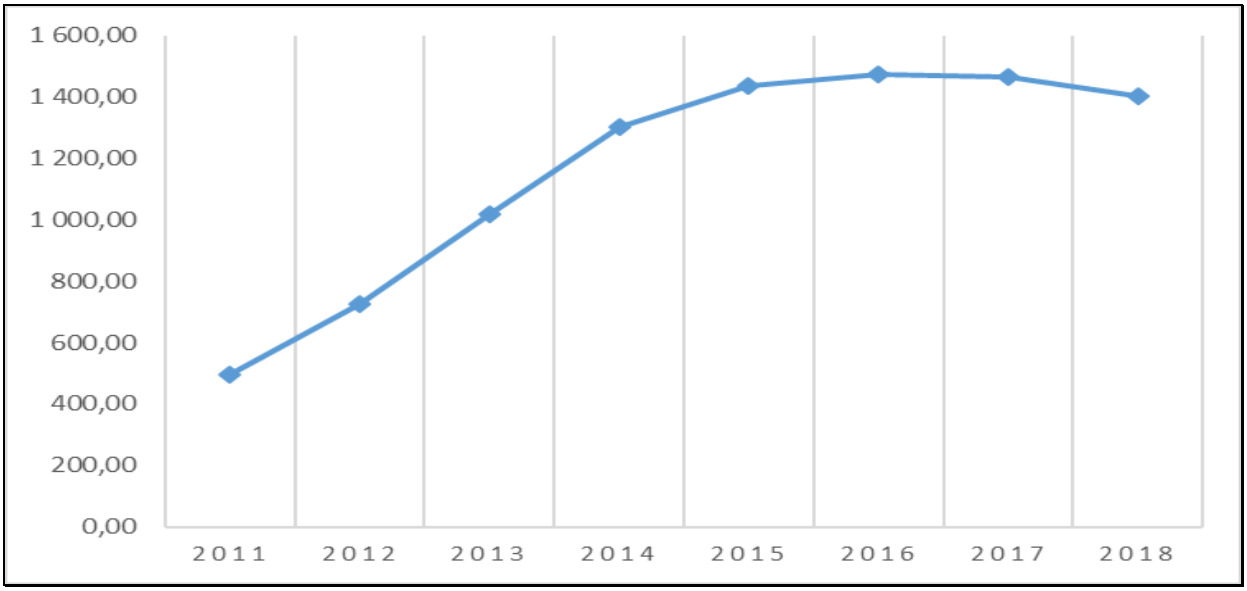
26. As previously defined, digital economy refers to the production and trade of ICT goods and services, as well as the production and trade of ICT-based goods. In the value chain, the telecom and network equipment manufacturers who design and manufacture the components, hardware and software (terminals, CPUs, routers, gateways, transponders, etc.) come first, followed by fixed, mobile and internet telecommunications operators, while service providers and other platforms complete the chain. **The complete value chain of the digital economy is described in Annex 3.**

27. **Regarding ICT goods**, recent trends point to personal computers (PCs) and smartphones. All categories of personal computers (desktop or notebook, office automation) experienced a 3.6% sales decline in the third quarter of 2017 (June to September) compared with the same period in 2016, according to the Gartner firm. Thus, only 67 million pieces were sold in 2017, compared with 69.5 million pieces in 2016. This is the 12th consecutive quarter of declining sales.

According to the IDC firm,[13] Smartphone sales worldwide in number of units grew steadily from 2011 to 2016, before experiencing a slight slowdown thereafter. It should be noted that only six equipment manufacturers hold 75% of the market share. Throughout this period, turnover increased steadily, despite the slight decline in terms of units sold. At the beginning of the reporting period, i.e. in 2011, Nokia was the world's number one, but it no longer features among the leaders in the field. Samsung has topped the chart since 2012, and stands out from its competitors by innovations, the latest being the foldable smartphone.

Graph 1: Global smartphone sales trend (in millions of units) from 2011 to 2018

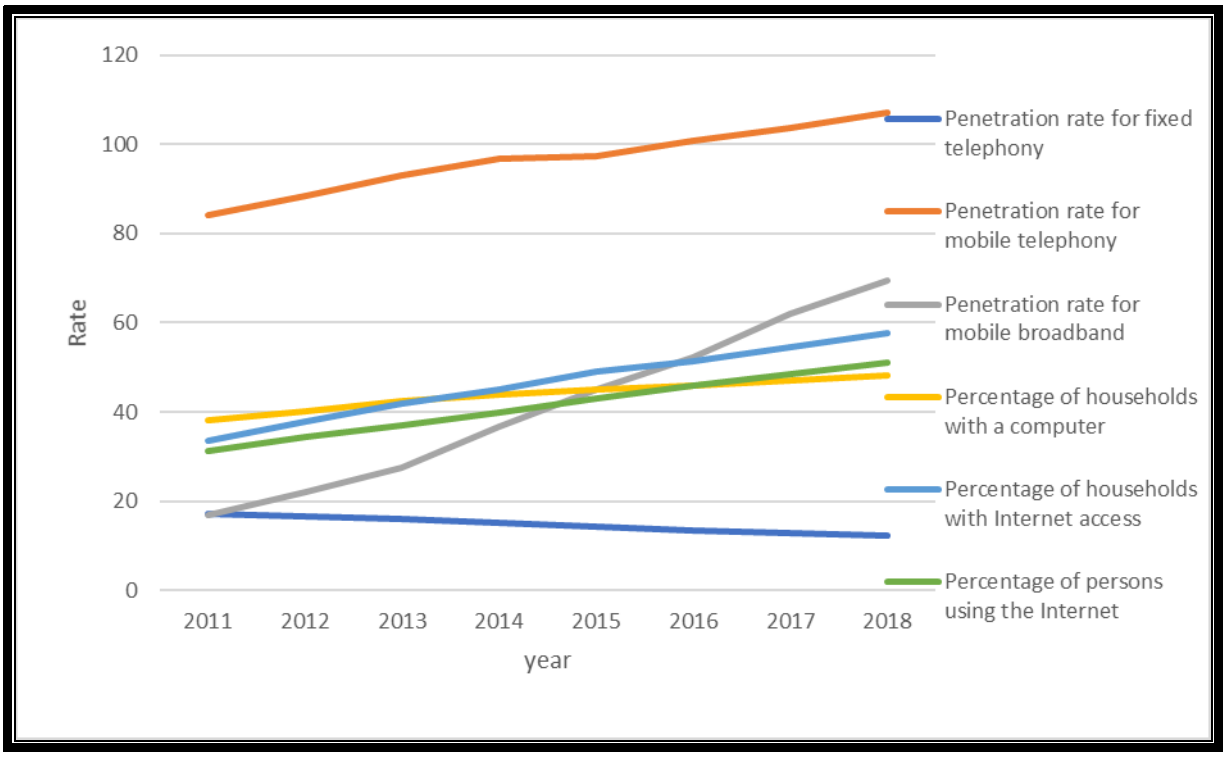
[13] https://www.zdnet.fr/actualites/chiffres-cles-les-ventes-de-mobiles-et-de-smartphones-39789928.htm



Source: IDC firm.

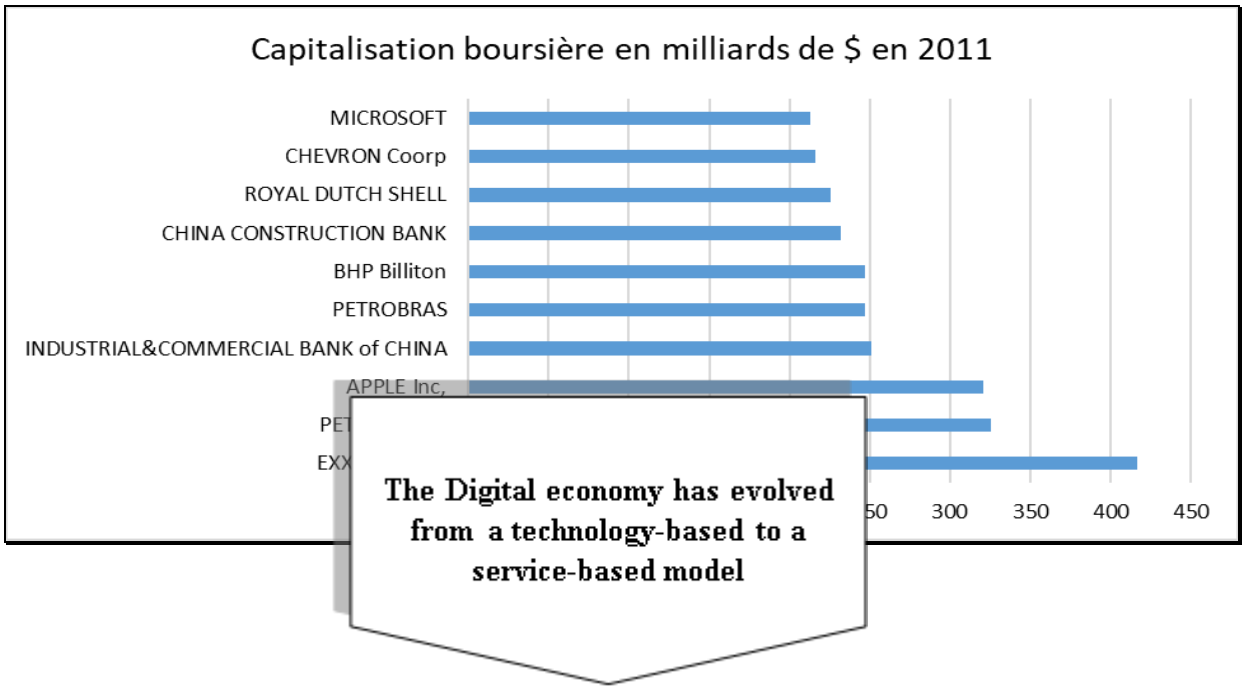
28. Regarding ICT services, including **the provision of fixed and mobile telecommunications services and the Internet** worldwide, several indicators are used, including the penetration rate of landline, mobile phone, mobile broadband, as well as the percentage of homes with a computer, homes with Internet access and individuals using the Internet. Generally, the fixed telecommunications penetration rate is declining, while that of the mobile and Internet is increasing. These rates, which are in fact global averages, do not reflect the enormous disparities between developed and developing countries.

Graph 2: **Evolution from 2011 to 2018 of the penetration rates of the fixed phone, mobile, mobile broadband and the Internet**

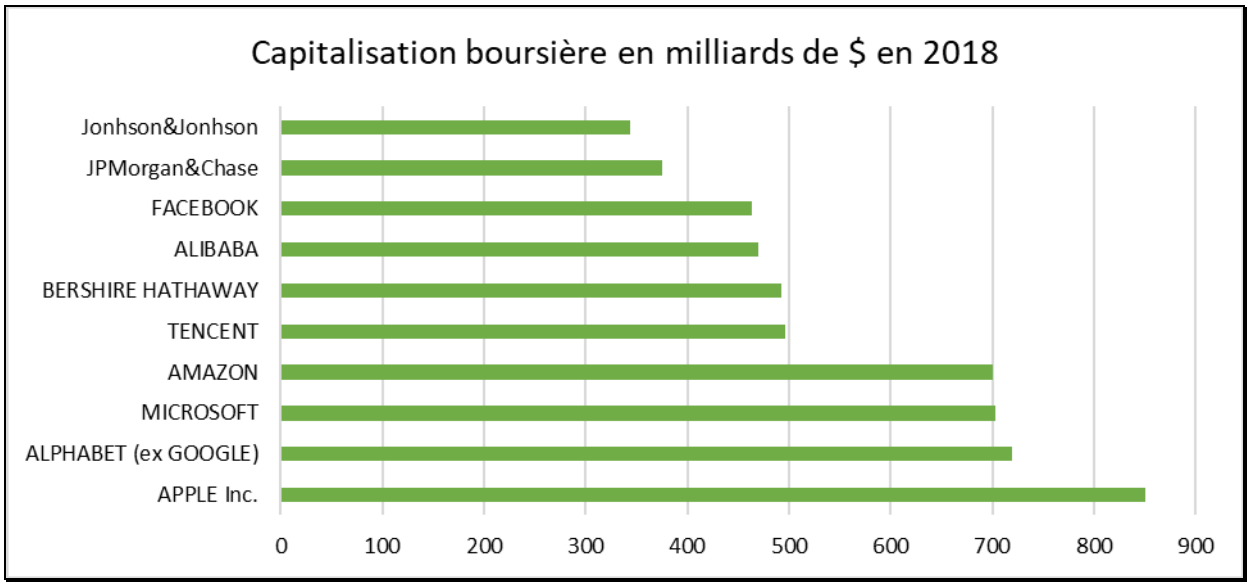


Source: Excerpts from ITU ICT-EYE database[14]

29. **The services provided within the digital economy ecosystem are diverse and varied, and, constitute the main driver**. Platforms (e-mail, e-commerce, music, video, social network, telecom service and IT) are booming and are pulling up the development of networks whose revenue they partly siphon (OTT). Some of these platforms (GAFAM: Google, Apple, Facebook, Amazon and Microsoft) experienced an explosion in their turnover *(US $ 326 billion turnover in 2014, the equivalent of Denmark's GDP, the world's 35th largest economy).* They occupy a dominant position on the market, having bought their competitors, innovated or developed an offensive marketing policy. Their growth is such that, among the ten largest stock market capitalizations, they have increased from two (at one time the oil companies dominated) to six from 2011 to 2018. The development of the digital economy has shifted from a model focused on technologies and networks to a service-oriented model. The following chart shows that the main stock market capitalizations in 2011 consisted of oil companies (Exxon mobil, Petrochina or Petrobras) but that in 2018, they all gave way to GAFAM.



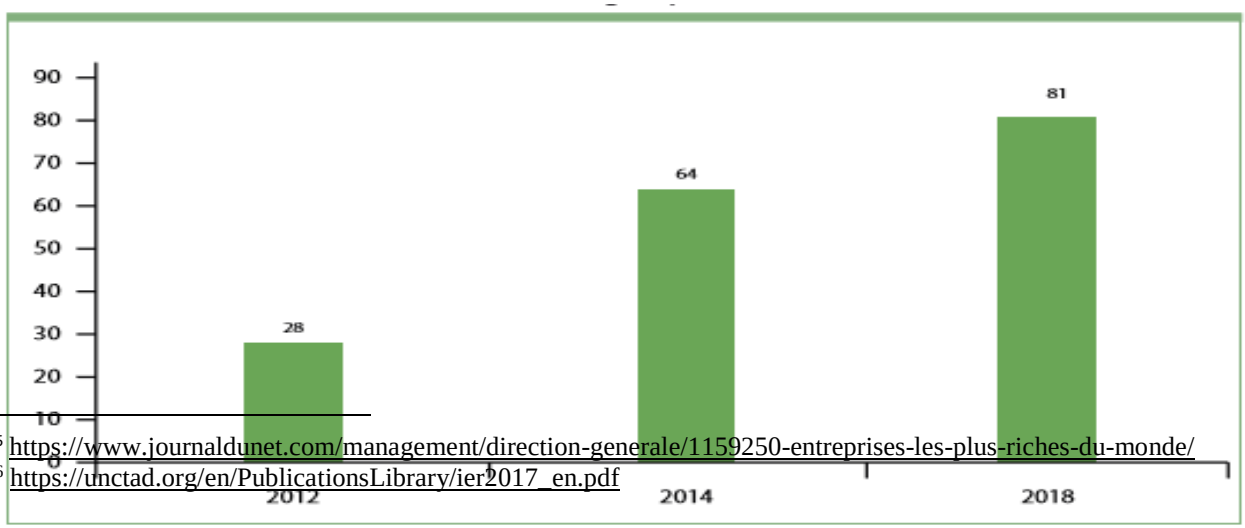
[14] https://www.itu.int/net4/itu-d/icteye/



Graph 3: **Comparison of the major market capitalizations between 2011 and 2018**
Source: FORTUNE on the website magazine[15]

30. **For ICT-based services**, despite the lack of official statistics as highlighted in the UNCTAD Information Economy Report 2017: "Digitalization, Trade and Development",[16] some developments can be highlighted if we take the example of **E-Government.** Indeed, the use of information and communication technologies (ICTs) by public administrations to make public services accessible to the users and to improve their internal functioning, or even rethink them to improve the transparency and productivity of the administration and services to users, is an important aspect to appreciate the development of the digital economy. In fact, it entails making information within the administrations available and accessible online, providing services directly online (obtaining authorizations and various permits such as the driving license, building permit, visas or reporting and paying taxes online) or making such government services accessible via mobile phone. The graph below shows that government services are also more likely to use ICTs in their relationship with citizens.

Graph 4: Number of countries (out of 100) having web sites, with services used, including by the vulnerable populations.

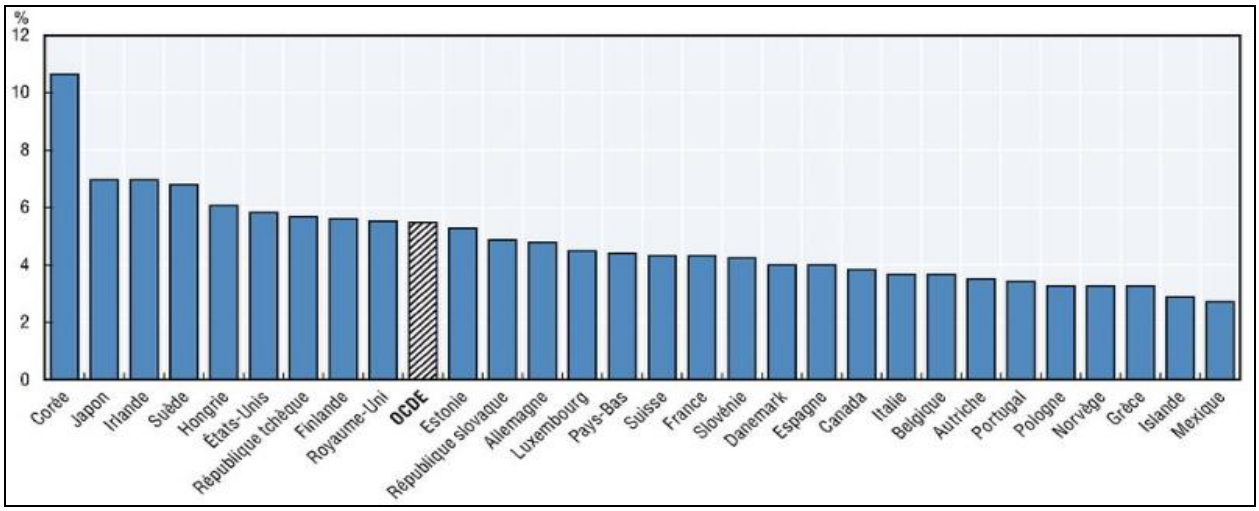


[15] https://www.journaldunet.com/management/direction-generale/1159250-entreprises-les-plus-riches-du-monde/
[16] https://unctad.org/en/PublicationsLibrary/ier2017_en.pdf

The digital economy is the basis of the 4th industrial revolution. Like the other three revolutions that preceded it, no country could remain on the side-lines.

31. The digital economy impacts the lives of citizens, businesses, administrations and other organizations by fostering social ties, minimizing costs and delays, expanding market access, and simplifying and dematerializing administrative procedures. At the macroeconomic level, the contribution of ICTs and digital technology to GDP makes it possible to quantify their input. Studies have shown that digital technology growth and GDP growth are positively correlated. Similarly, the reduction of costs and deadlines can increase labour productivity and the return on capital.

Graph 5: Weight of the ICT sector in the GDP of OECD countries, 2013



Source: OECD 2015 "OECD Prospects of the digital economy"[17]

32. For companies, the automation of production and marketing

For developed countries, the digital sector accounts for 6% of GDP, on average

[17] https://read.oecd-ilibrary.org/science-and-technology/perspectives-de-l-economie-numerique-de-l-ocde_9789264243767-fr#page48

processes and means increases their productivity. The World Bank Group's World Development Report 2016 "*Digital dividends"*[18] states that digital technologies augment human capital productivity and profitability in almost all sectors of the economy. It illustrates this argument with the example of Vietnam, where companies that trade online have total factor productivity of 3.6 points higher than that of companies that do not.

33. With regard to the creation of enterprises and jobs, there are two effects: on one hand, the creation of jobs and on the other hand, their destruction and redistribution. The creation of businesses and jobs is driven by innovation and disruption that are the crux of progress in the digital economy. According to the same World Bank Group's *World development report 2016,*[19] in developing countries, the ICT sector accounts for only about 1 percent of the workforce on average, while in OECD countries, about 3 to 5% of employment is in this sector, which is low compared with their overall weight in the economy. However, job creation in the ICT sector creates other jobs in other sectors because of its multiplier and energizing effects. In addition, new opportunities for business creation and self-employment are rapidly opening up in the digital economy. These are very often high-tech jobs needed to design and produce appropriate software and hardware solutions. For countries and regions with a skilled and cheap workforce, outsourcing (like call centres) is a significant source of job creation.

34. Nevertheless, most manual jobs and repetitive and routine tasks (secretaries and clerks, manufacturing or repair technicians, cashiers, drivers, guards, etc.) may be eliminated. Since these types of jobs are usually low-paid and performed by those with low qualifications, there is a risk of increased inequality. Moreover, thanks to advances in artificial intelligence and robotics, some intellectual activities (translator, legal or tax consultant, etc.) will be automated, resulting in job cuts.

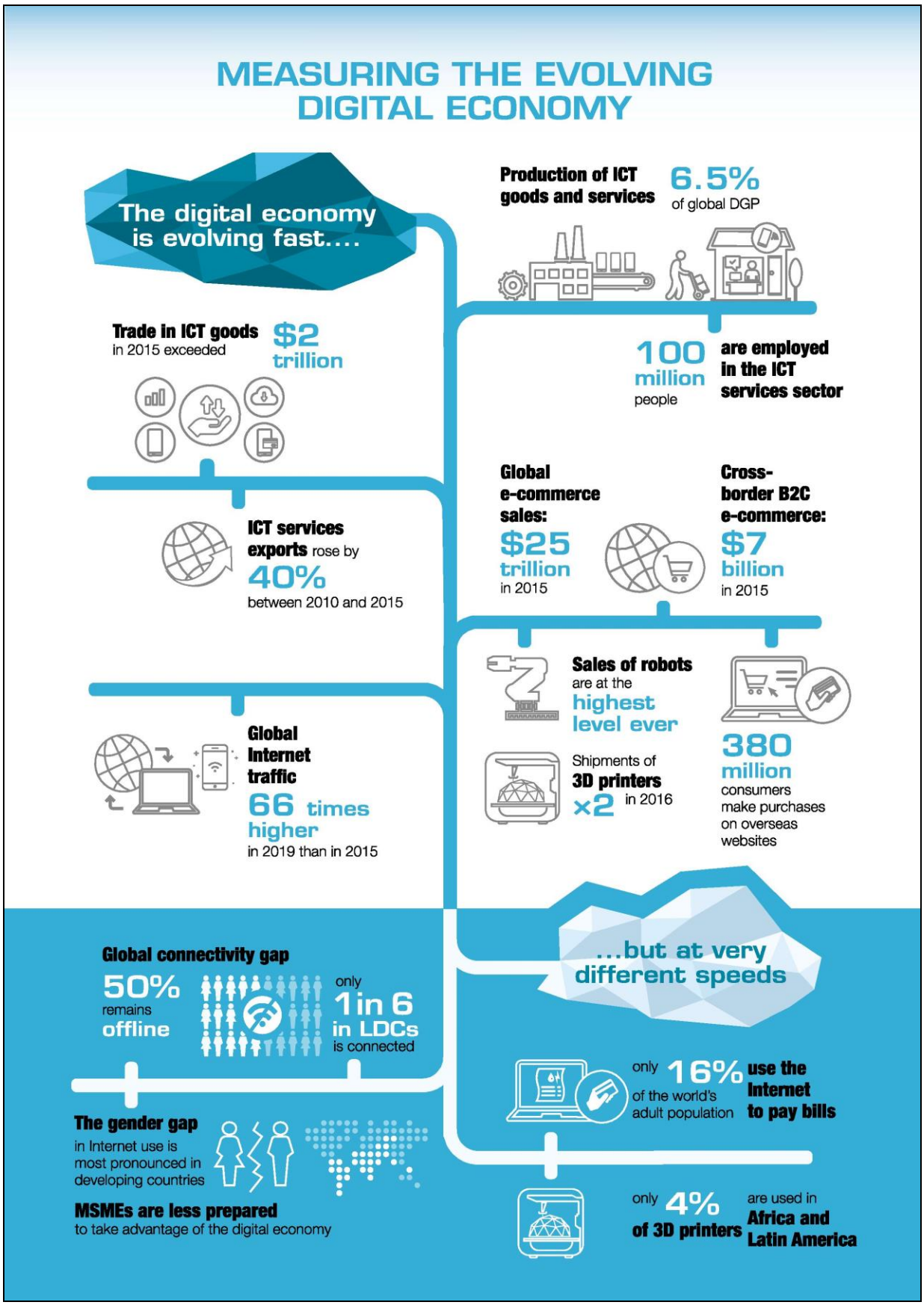
35. Experts believe that, globally, job creation can largely offset losses if appropriate measures are taken, because there is more redistribution of jobs than destruction, with many intermediate jobs eliminated. According to the 2017 McKinsey & Co report "Jobs lost, jobs gained: Workforce transitions in a time of automation",[20] by 2030, they can reach either 800 million human jobs, 400 million human jobs or 10 million human jobs, depending on whether the pace of transformation is high, medium or slow. Despite these job losses, the same report predicts a growth in labour demand and consequently a new job creation linked to the estimated digital transformation of between 555 million to 890 million jobs created, which is much higher than the number of job losses, and whatever the hypothesis considered.

[18] http://documents.worldbank.org/curated/en/ 896971468194972881/pdf/102725- PUB-Replacement-PUBLIC.pdf
[19] Idem
[20] https://www.mckinsey.com/

36. The below figure from the UNCTAD Information Economy Report 2017 "*Digitalization, Trade and Development"*[21] provides some indicators that measure the digital economy.

Figure 4: Some indicators to measure the digital economy

[21] https://unctad.org/en/PublicationsLibrary/ier2017_en.pdf



Source: UNCTAD Information Economy Report 2017: "*Digitalization, Trade and Development"* [22]

[22] https://unctad.org/fr/PublicationsLibrary/ier2017_fr.pdf

2.2.2 Opportunities, issues, risks and challenges related to the digital economy

37. The challenges of the digital economy at global level are multiple. One of the first challenges is that of **the digital divide,** which can be associated with access, price affordability, age, language, bandwidth, gender, place, availability, content or usefulness. As indicated above (Graph 2), in 2018, 31% of the world's population did not have access to mobile broadband. The digital divide linked to the availability of access will be very significant with the advent of the 5G mobile phone that carries high speeds and requires the use of fibre optic backbone.

> 5G enables faster transport of large amounts of data, reliably connects a very large number of devices, and handle very large volumes of data in record time, and is expected to connect people, objects, data, applications, transport systems and cities in intelligent network communication environments. 5G is expected to support applications such as smart homes and buildings, smart cities, 3D video, work and games in the cloud, remote surgery, virtual and augmented reality, as well as massive machine-to-machine communications for industrial automation systems and autonomous cars, services that the 3G and 4G networks currently have difficulties to support.

38. Another challenge is that of human resources. Indeed, given that innovation is at the centre of progress in the digital economy, the challenge here is to **have a critical mass of well-trained and continuously renewed human resources and state-of-the-art research institutions and centres.** In addition, according to the OECD 2019 report "How is Life in the Digital Age? Opportunities and Risks of the Digital Transformation for People's Well-being",[23] digital technologies place society at a major risk of widening inequalities between people who have the right skills to use them and those who do not.

39. Given the demand for bandwidth resulting from an increase in the volume of data, the digital sector experienced a 4% worldwide increase in the **cost of investments** from 2014 to 2016, and this trend will continue in the years to come. There is thus a challenge in financing electronic communications infrastructure and digital services to accompany the technological changes that are already underway and those to come (5G, AI, robotics).

40. Since the entire process of managing production, human and financial resources, as well as the company's relations with suppliers and consumers relying on the use of ICTs and that no technology is 100% safe, **cyber-threats** pose a significant risk, and safeguards to address them (cybersecurity) should be implemented. The vulnerabilities of digital technologies can arise from their inadequate robustness, non-compliance with procedures, mismanagement of incidents, insufficient control or deficient human resources, and open doors to cyberattacks.

41. A **conducive political, legal and regulatory environment** is necessary and the establishment of such an environment is the main challenge in terms of conditioning the others. This new environment should take into account the paradigm shifts in the global digital economy ecosystem, moving from a technology-based development model to a new model based on software/applications, services and usage.

[23] https://read.oecd-ilibrary.org/science-and-technology/how-s-life-in-the-digital-age/summary/french_9ae7e081-fr#page2

Box 3: Malaysia's e-Rezeki programme

Southeast Asian country with an area of 329750 km^2 for 31 million inhabitants, Malaysia is ranked among the best in the world in the field of digital economy. The e-Rezeki programme gives a view of what is being done there. It is available at training centres across the country and aims to help those who are part of the poorest 40% of households with a monthly income below MYR 4,000 (around US $ 950), supplement their income by finding a job online. It also helps people who previously had no online experience to learn basic digital skills. It proposes three main areas of work: micro-digital tasks such as data extraction or photo moderation; digital tasks such as the provision of services ordered online; and digital work such as the one done by graphic designers or virtual assistants.

In July 2017, there were 23,000 active users and 150,000 people registered on the platform. The government envisages 200 centres operating throughout the country by the end of 2017. In 2016, 17.8 percent of Malaysia's national GDP was based on the digital economy, according to government figures. There is, however, a division in socioeconomic development between urban and rural areas. One of the measures is to ensure that all Malaysians are ICT literate and that every Malaysian has at least basic Internet access and basic Internet skills.

With Internet access and the training provided by State-run rural Internet centres, local Malaysian entrepreneurs are strengthening their online presence and reaping the benefits. These training centers are spread all over Malaysia and train people looking for jobs online. In 2016, 150,000 registered users earned MYR 17 million (nearly US $ 4 million) through this program. Given that a considerable portion of today's schoolchildren will occupy jobs that are yet to be created, the new digital skills acquisition programs such as this one will be important in preparing the workforce for the future.

Source: ITU news magazine No. 3/2017 "How ICTs accelerate the achievement of the SDGs"

2.3 The digital economy at the regional level

2.3.1 The digital economy: a foundation for the implementation of the African Union Vision 2063

42. To build an integrated, prosperous and peaceful Africa driven by its own citizens and representing a dynamic force in the international arena, the African Union has set priorities to be achieved for the continent's development through Agenda 2063. This Agenda encapsulates Africa's aspirations for 2063 with focus on the following seven points: a prosperous Africa based on inclusive growth and sustainable development; an integrated continent politically united and based on the ideals of Pan Africanism and the vision of African renaissance; an Africa of good governance, democracy, respect for human rights, justice and the rule of law; a peaceful and secure Africa; Africa with a strong cultural identity, common heritage, values and ethics; an Africa whose development is people driven, relying on the potential offered by African people, especially its women and youth; and an Africa as a strong, united, resilient and influential global player and partner.

43. For the implementation of Agenda 2063 based on digital technologies, in April 2015 the African Union adopted a vision formulated as follows: "ICT: a continent on equal footing with

the rest of the world as an information society, an integrated e-economy where every government, business and citizen has access to reliable and affordable ICT services by increasing broadband penetration by 10% by 2018, broadband connectivity by 20 percentage points and providing access to ICTs to children in schools and venture capital to young ICT entrepreneurs and innovators and migration to digital TV broadcasting by 2016".[24]

44. Another pan-African institution, Smart Africa Alliance, has set itself the vision to "Transform Africa into a single digital market". This vision is based on the following principles: to put ICTs at the centre of the national socioeconomic development agenda; to put the private sector first; to improve access to ICTs especially broadband; to improve accountability, efficiency and openness through ICTs and to leverage ICTs to promote sustainable development.

45. The digital economy offers many opportunities for Africa. Indeed, the digital technology in aspects such as design and development of applications, artificial intelligence or big data processing requires little investment in equipment or hardware, because it only requires a computer equipped with programming languages, and is based mainly on the brainpower, which puts Africans practically at par with the others (in the case where the qualitative and quantitative deficit in human resources is resolved) for the development of innovative software solutions tailored to their needs.

46. There are concrete examples to demonstrate the positive impact of the digital economy in our continent. It can significantly improve the continent's government revenue-to-GDP ratio, thus providing the opportunity to adequately fund critical national development programmes. For instance, Rwanda increased revenue collection by 6% of GDP by introducing e-taxation and South Africa is using online tax payments to reduce compliance costs by 22.4% while reducing the compliance time to value-added tax by 21.8%. Kenya is pioneer in the field of mobile money with its M-Pesa product.

Box 4: Towards financial inclusion with the mobile money M-Pesa in Kenya

M-Pesa (M for mobile and **pesa**, money in Swahili) is a mobile phone payment and money transfer system, launched in 2007 by Safaricom in Kenya. M-Pesa allows users who have an ID card or passport to easily deposit, withdraw and transfer money with a mobile phone. This service leans on an account stored on their mobile phone and is operated by SMS secured by a personal identification number (PIN) and using USSD codes. It allows depositing and withdrawing money, transferring money to other customers or non-clients, paying bills, buying communication credits, transferring money between M-Pesa service and a bank account (in some countries only, including Kenya), to save money and obtain credits.

M-Pesa has grown rapidly and since 2010 has become the most successful mobile phone finance service in developing countries. This service allows a better readability and traceability of transactions and thus allows to fight effectively against corruption. It has also helped reduce crime in companies largely based on cash exchanges. The growth of the service has become phenomenal.

In November 2014, M-Pesa's transactions for the first eleven months of 2014 were valued at KES 2,100 billion, an increase of 28% compared to 2013, which represents almost half of the country's GDP. The success is based in particular on the network of agents who form a tight

[24] "Agenda 2063: The Africa we want" https://www.un.org/en/africa/osaa/pdf/au/agenda2063.pdf

network of 60,000 small businesses for which being an agent M-Pesa brings a supplement of appreciated income.

Since 19 November 2014, Safaricom has been offering an Android application for M-Pesa. The penetration of M-Pesa among Safaricom customers is close to 90%. In the third quarter of 2018, 730.2 million transactions and nearly 19.6 billion dollars passed through this process in the country, representing an increase of 19.45% over the previous year. This growth is particularly related to the 100% mobile penetration rate and the interoperability implemented in April 2018, allowing an M-Pesa customer to send or receive money in real time on an account of another operator, thanks to an agreement between the telecommunication operators, which guarantees the interaction between the six mobile money transfer platforms in the country. Another explanation for M-Pesa's success lies in the role of the regulators, who authorized the launch of the service, despite intense lobbying by banks and other groups to prevent it. When M-Pesa arrived, there was no regulation on the transfer of money via the mobile phone, but the Kenyan authorities allowed it to work.

Source : Article Jeune Afrique « Mobile money : une success story nommée M-Pesa »

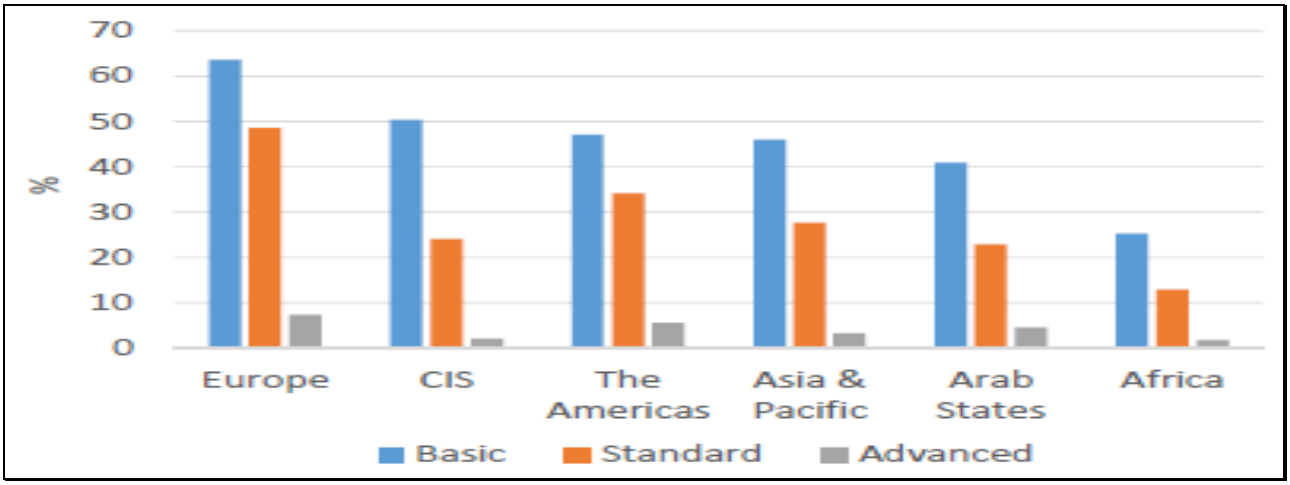
47. The continent has started building its institutional and regulatory frameworks to facilitate the emergence and expansion, at lower risk, of the digital economy on our continent. Indeed, the African Union has a portfolio of projects on the harmonization of several instruments. Worthy of mention is the African Union Convention on Cyber Security and Protection of Personal Data (adopted in June 2014 in Malabo and developed by ECA at the request of the AU). With regard to operational projects, the establishment of national and regional Internet exchange points is being carried out under the banner of the AXIS (African Internet eXchange System) project.

48. However, the continent faces several challenges. Indeed, it is clear that the success of projects in the information and knowledge society depends highly on the quality of human resources. Skills in the digital field have become indispensable. They facilitate job search, integration into the workplace, self-learning, lifelong learning and self-employment. ICT tools are numerous in the professional and social environment, and change constantly, hence the need for strong capabilities and being able to adapt to new technologies. The ITU classified the various skills into three:

- Operational skills to use digital tools
- Information management skills,
- Content creation and social skills.

49. Cutting-edge skills are acquired in faculties and engineering schools, which must work closely with research centres to promote innovation. The graph below shows that Africa is still the region of the world with the least digital skills.

Graph 6: Percentage of the population with digital skills in the various sub-regions of the world in 2017



Source: ITU, "Measuring the information society report, 2018"[25]

Most countries, regardless of their income levels, rely on STEM (Science, Technology, Engineering & Mathematics) and research and innovation to boost their sustainable economic growth and foster their development.

50. One of the indicators to measure the efforts made in this field is the gross domestic expenditure on research and development (GERD) which corresponds to the research and development (R&D) carried out on the national territory regardless of the origin of the funds. One part is executed by public administrations and the other by companies. This indicator takes into account recurrent expenditure (R&D personnel payroll and operating expenses) and capital expenditure (purchases of equipment needed to perform internal R&D and real estate operations carried out during the year). In 2015, UNESCO published the "UNESCO Science Report: Towards 2030"[26] which shows GERD as a percentage of GDP by country for 2011. With values ranging from 0.01 to 1.06, the report highlights that while sub-Saharan Africa's share of the world's population increased by one percentage point between 2007 and 2013, its GDP increased by only 0.3% and its gross R&D expenditure (GERD) increased by only 0.1%.

[25] https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-1-E.pdf
[26] https://en.unesco.org/sites/default/files/usr_19-7_5_researchers_gers_ssafrica_fr.pdf

Table 1: GERD by country for 2011

	DIRD (% du PIB)	DIRD par habitant (en dollars PPA)	DIRD par chercheur (recensement), en milliers de dollars PPA	DIRD par source de financement (%), 2011*				
				Entreprises	État	Enseignement supérieur	Secteur privé à but non lucratif	Étranger
Afrique du Sud	0,73[+1]	93,0[+1]	113,7[+1]	38,3[+1]	45,4[+1]	0,8[+1]	2,5[+1]	13,1[+1]
Botswana	0,26[+2]	37,8[+2]	109,6[+2]	5,8[+2]	73,9[+2]	12,6[+2]	0,7[+2]	6,8[+2]
Burkina Faso	0,20[-2]	2,6[-2]	–	11,9[-2]	9,1[-2]	12,2[-2]	1,3[-2]	59,6[-2]
Burundi	0,12	0,8	22,3	–	59,9[3]	0,2[3]	–	39,9[3]
Cabo Verde	0,07	4,5	17,3	–	100	–	–	–
Éthiopie	0,61[+2]	8,3[+2]	95,3[+2]	0,7[+2]	79,1[+2]	1,8[+2]	0,2[+2]	2,1[+2]
Gabon	0,58[-2]	90,4[-2]	258,6[-2]	29,3[-2]	58,1[-2]	9,5[-2]	-	3,1[-2]
Gambie	0,13	2,0	59,1	–	38,5	–	45,6	15,9
Ghana	0,38[-1]	11,3[-1]	108,0[-1]	0,1[-1]	68,3[-1]	0,3[-1]	0,1[-1]	31,2[-1]
Kenya	0,79[-1]	19,8[-1]	62,1[-1]	4,3[-1]	26,0[-1]	19,0[-1]	3,5[-1]	47,1[-1]
Lesotho	0,01	0,3	14,3	–	–	44,7	–	3,4
Madagascar	0,11	1,5	13,3	–	100,0	–	–	–
Malawi	1,06[-1]	7,8[-1]	–	–	–	–	–	–
Mali	0,66[-1]	10,8[-1]	168,1[-1]	–	91,2[-2]	–	–	8,8[-1]
Maurice	0,18[+1]	31,1[+1]	109,3[+1]	0,3[+1]	72,4[+1]	20,7[+1]	0,1[+1]	6,4[+1]
Mozambique	0,42[-1]	4,0[-1]	60,6[-1]	-	18,8[-1]	–	3,0[-1]	78,1[-1]
Namibie	0,14[-1]	11,8[-1]	34,4[-1]	19,8[-1]	78,6[-1]	–	–	1,5[-1]
Nigéria	0,22[-4]	9,4[-4]	78,1[-4]	0,2[-4]	96,4[-4]	0,1[-4]	1,7[-4]	1,0[-4]
Ouganda	0,48[-1]	7,1[-1]	85,2[-1]	13,7[-1]	21,9[-1]	1,0[-1]	6,0[-1]	57,3[-1]
Rép. dém. du Congo	0,08[-2]	0,5[-2]	2,3[-2]	–	100	–	–	–
Sénégal	0,54[-1]	11,6[-1]	18,3[-1]	4,1[-1]	47,6[-1]	0,0[-1]	3,2[-1]	40,5[-1]
Seychelles	0,30[-6]	46,7[-6]	290,8[-6]	–	–	–	–	–
Tanzanie	0,38[-1]	7,7[-1]	110,0[-1]	0,1[-1]	57,5[-1]	0,3[-1]	0,1[-1]	42,0[-1]
Togo	0,22[+1]	3,0[+1]	30,7[+1]	-	84,9[+1]	0,0[+1]	3,1[+1]	12,1[+1]
Zambie	0,28[-3]	8,5[-3]	172,1[-3]	–	–	–	–	–

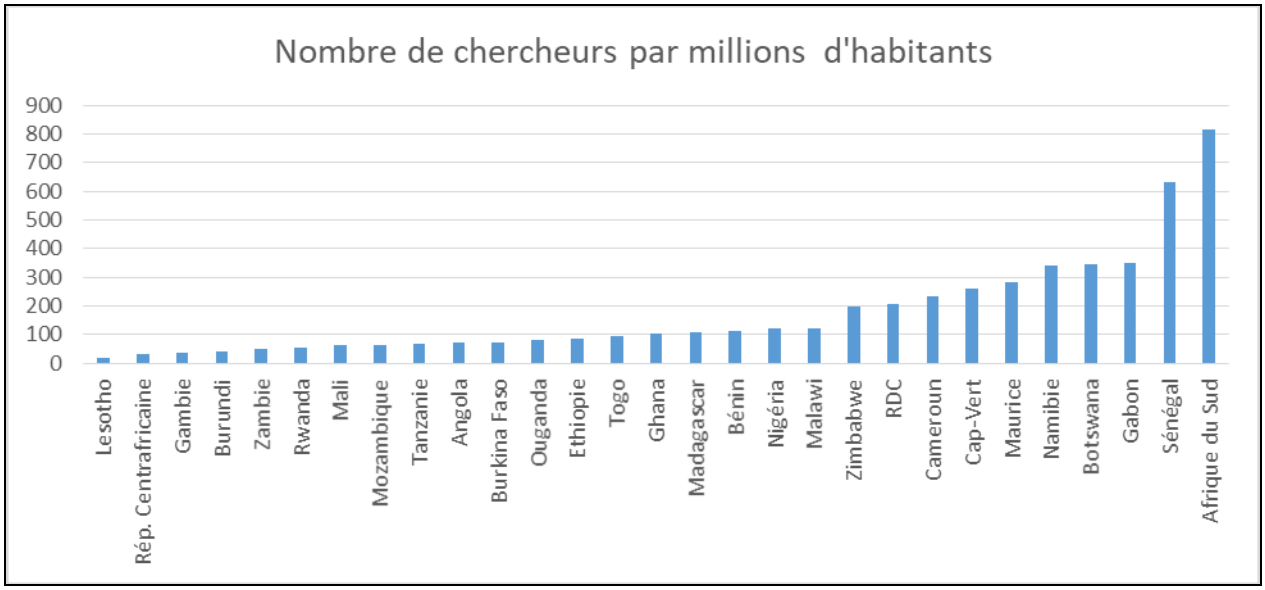
Source: "UNESO Science Report, Towards 2030"[27] 2015, UNESCO

51. We will also illustrate the research and development efforts made in the continent through the below chart, which shows the number of researchers in sub-Saharan Africa per million inhabitants. The graph shows that the number of researchers in Central Africa per million

[27] https://en.unesco.org/sites/default/files/usr_19-7_5_researchers_gers_ssafrica_fr.pdf

inhabitants varies from 31 (in CAR) to 350 (in Gabon), which is significantly lower than that of Senegal (631) or South Africa (818).

Graph 7: Number of researchers in Sub-Saharan Africa per million inhabitants, 2013 or the closest year



Source: "UNESO Science Report, Towards 2030"[28] 2015, UNESCO

52. To boost research and innovation, several countries rely on technology hubs, or smart cities, like the Silicon Savannah in Kenya, the African counterpart of Silicon Valley which is part of the Konza Technology City (KTC).[29] KTC is an area of 2,000 hectares, located 60 km south of the capital Nairobi and aims to create 20,000 jobs in five years and ten times more from 2030. It is expected to be developed to accommodate a true ecosystem of startups, investors and researchers. The development of Konza Technology City could cost between $ 10 and $ 14.5 billion, with 5% of the fund from the Government of Kenya. The rest will come from private actors, who will lease the land to the Kenyan Government in return for tax benefits. Other indicators such as the number of engineering schools (or universities) and research centres can also be used (see Annex 4).

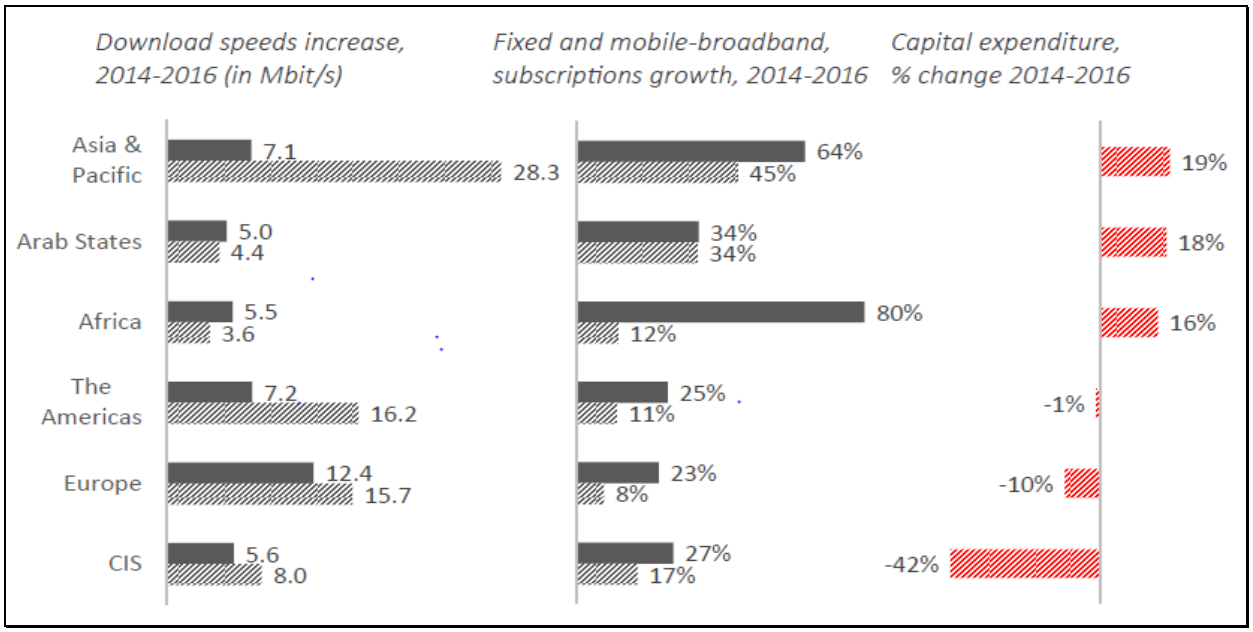
2.3.2 Some performance and impact indicators of the digital economy in Africa

20 000 new jobs created in 5 years in the digital sector

[28] https://en.unesco.org/sites/default/files/usr_19-7_5_researchers_gers_ssafrica_fr.pdf
[29] http://www.konzacity.go.ke/

53. In the digital economy, communications, exchanges and transactions must be fluid and secure. Unfortunately, data transmission and file download speeds in Africa are the lowest, compared with other regions of the world.

Graph 8: Trend, from 2014 to 2016, of download speed, fixed phone subscriptions and mobile broadband, as well as capital expenses, in the various regions of the world

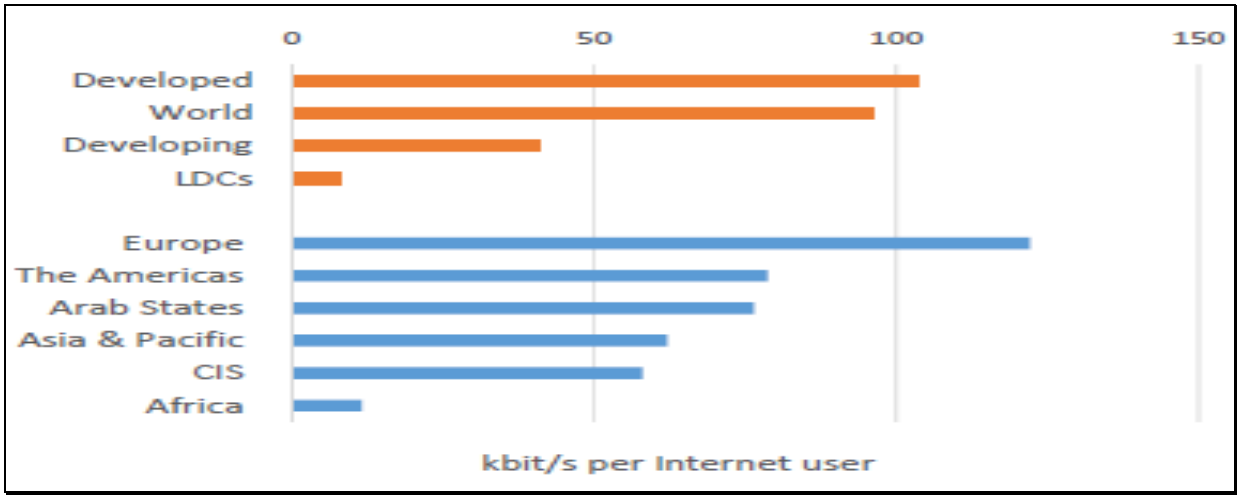


Source: "Measuring the information society report",[30] 2018, ITU

54. Another Internet network performance measurement parameter that remains the most widely used network is the average international bandwidth available to each user for its traffic, expressed in Kbits/s per internet user. The graph below shows that this international bandwidth is by far the lowest in Africa.

Graph 9: **International bandwidth distribution by Internet user for the various regions of the world, in 2017**

[30] https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-1-E.pdf



Source: "Measuring the information society report"[31] 2018, ITU

55. Security can be assessed from the overall cybersecurity index, which aggregates robustness across the following five pillars: legal, technical, organizational, human resources and cooperation. According to the 2017 ITU report, Africa's score on each of the five pillars is the lowest compared with other regions of the world, although some African countries (Mauritius, Rwanda and Kenya) stand out and have quite acceptable scores.

Table 2: **Global cybersecurity index in the regions of the world on each of the five pillars, 2017**

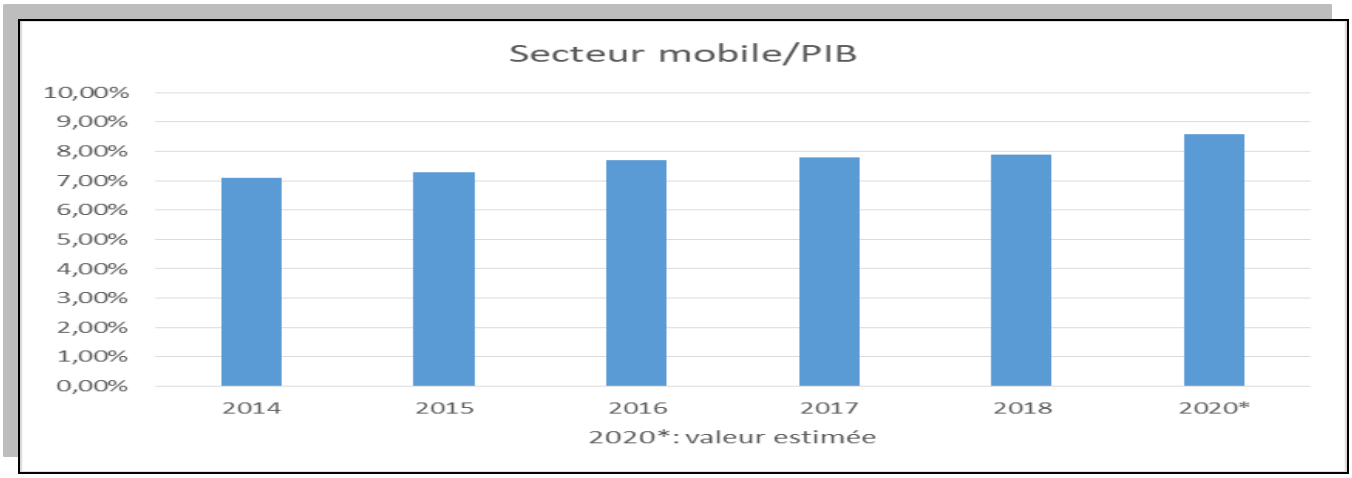
REGION	LEGAL	TECHNICAL	ORGANIZATIONAL	CAPACITY BUILDING	COOPERATION
AFRICA	0.29	0.18	0.16	0.17	0.25
AMERICAS	0.4	0.3	0.24	0.28	0.26
ARABIC	0.44	0.33	0.27	0.34	0.29
ASIA-PACIFIC	0.43	0.38	0.31	0.34	0.39
IEC	0.58	0.42	0.37	0.38	0.4
EUROPE	0.62	0.61	0.41	0.5	0.47

Source: "ITU Global cybersecurity index"[32] Rapport, 2017

56. The positive impact of digital technology on GDP formation or job creation has been established by various studies and this is valid for all regions of the world. The report "Measuring the Information Society" published by the ITU in 2018 mentions that a 1% increase in the digital sector leads to a 0.13% increase in GDP. In our case, given the information limitations, we will use data from the mobile sector (whose data are available) to estimate its impact on GDP. The graph below shows the contribution of the mobile sector to GDP in sub-Saharan Africa.

Graph 10: Contribution of the mobile sector to GDP in Sub-Saharan Africa, from 2014 to 2020

[31] Idem
[32] https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI.01-2017-R1-PDF-E.pdf



Source: "GSMA Mobile sector economy – Sub-Saharan Africa" Reports[33] [34]

A 1% increase in the digital sector leads to a GDP increase of 0.13%

E-commerce offers consumers in underserviced regions the opportunity to access a wide range of products at competitive prices through new digital technologies. There are currently a considerable number of startups involved in E-commerce in Central Africa, particularly Cameroon (12), DRC (5) and Gabon (1). With the recently launched NYSE E-commerce platform JUMIA, there are bright prospects for this sector and its potential, particularly in terms of job creation and added value.

3. SITUATIONAL ANALYSIS OF THE DIGITAL ECONOMY IN CENTRAL AFRICA

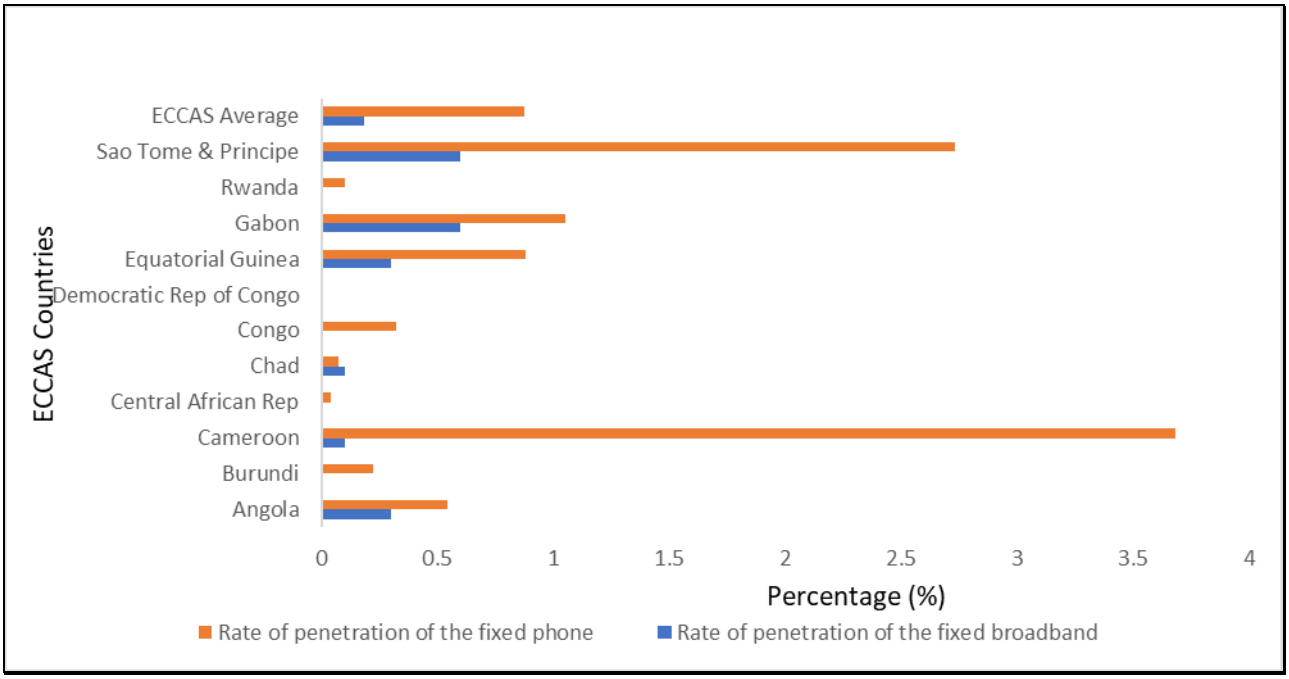
3.1 Communications infrastructure and digital services

3.1.1 Telecommunication and digital services

57. The services offered are grouped into fixed and fixed broadband telephony services, mobile and broadband mobile services, internet access and digital services. The graph below shows the penetration rate of fixed and fixed broadband telephony for the eleven ECCAS countries in 2017. Both rates are extremely low (0 to 4%) and have a respective sub-regional average of 0.87% and 0.18%, respectively. These rates are lower than the African average and the world average for fixed telephony (12.4%).

Graph 11: Rate of penetration of the fixed phone and fixed broadband, ECCAS countries, 2017

[33] https://fr.readkong.com/page/l-economie-mobile-de-l-afrique-subsaharienne-2013-9377219?p=1
[34] https://www.gsmaintelligence.com/research/?file=0c798a6a56bdb31d4bc3b4ff4a35098d&download



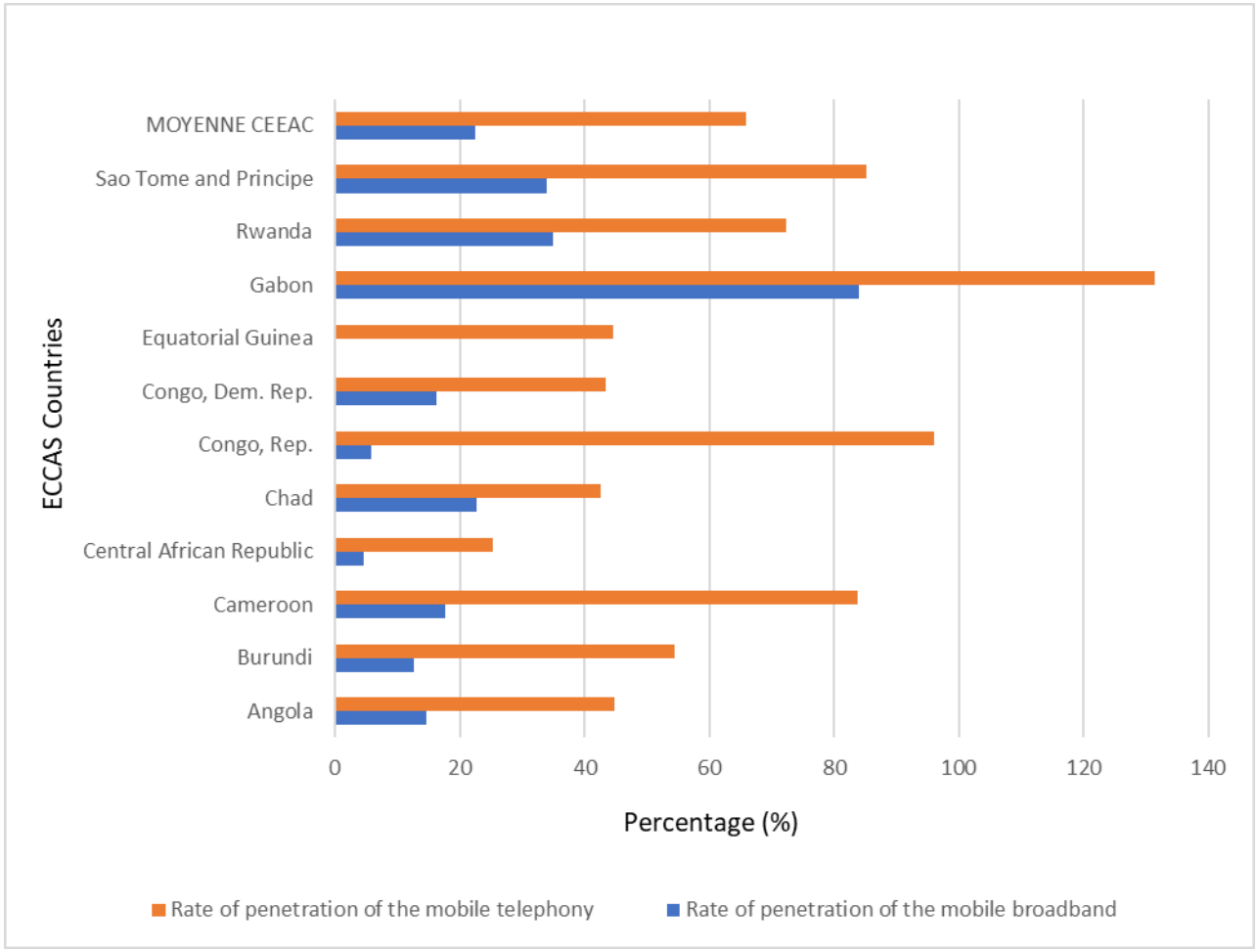
Source: ITU's ICTEYE database[35]

58. For mobile and mobile broadband services, the graph below gives the penetration rate for ECCAS countries in 2017. The two rates are constantly increasing from one year to the next, with a sub-regional average of 65.81% and 22.48% respectively and are close to the African average and below the world average (103,6% and 62% respectively).

59. For broadband, transmission speeds of a few megabits (less than 10) are also low compared with the global trend (hundreds of megabits per second). These mobile penetration rates do not take into consideration subscribers with multiple SIM cards, which means it is even lower if calculated for single subscribers only.

Graph 12: Rate of penetration of the mobile telephony and mobile broadband, ECCAS countries, 2017

[35] https://www.itu.int/net4/itu-d/icteye/

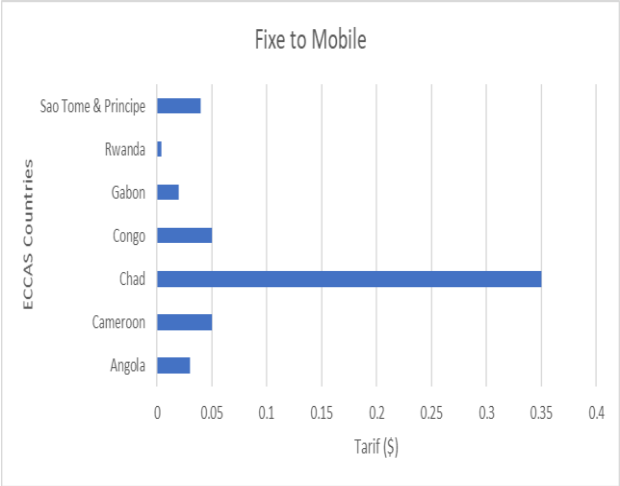


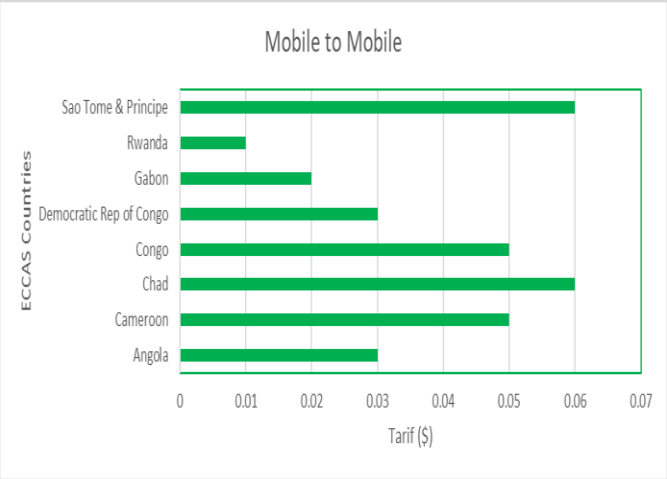
Source: ITU ICT-EYE database [36]

60. Interconnection rates between operators and service providers, or wholesale rates, affect the end-user tariff and may constitute barriers to entry for service providers. The graph below shows the fixed-to-mobile and mobile-to-mobile interconnection tariff for the ECCAS countries with available data. They are taken from a more general table in Annex 5. It could be noted that countries such as Rwanda and Gabon have low mobile-to-mobile interconnection rates but also the best mobile penetration rates.

Graph 13: **Fixed-to-mobile and mobile-to-mobile interconnection rates within ECCAS**

[36] https://www.itu.int/net4/itu-d/icteye/





61. Three indicators are used to assess access to the Internet in the ECCAS region:

i) Percentage of individuals using the Internet,

ii) Percentage of homes with a computer and

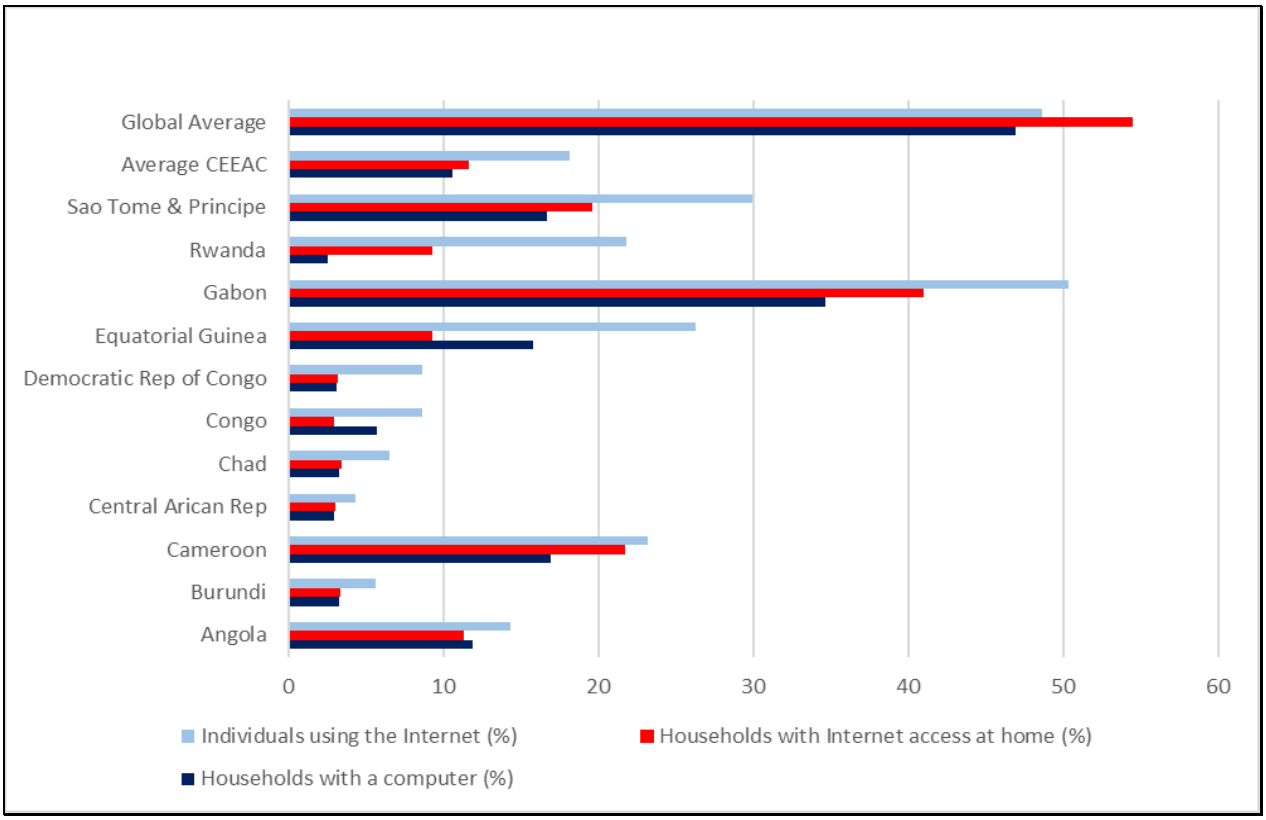
iii) Percentage of homes with Internet access.

The three indicators are illustrated by the graph below. In the sub region, they are well below global averages (48.6%, 46.9% and 54.5% respectively).

For all countries in the sub-region where data on the distribution of Internet penetration by gender are available, we will notice a clear gender digital divide.[37]

[37] https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx

Graph 14: **Percentage of homes with a computer, Internet access and Internet users for 2017, World and CEEAC**



Source: ITU's ICT-EYE database [38]

62. In the digital economy ecosystem, digital services cover all areas and are varied. In the case of ICT-based services, statistics for the sub-region are quite limited. The example of e-commerce will be used to present the current situation in Central Africa. Electronic commerce refers to the process of buying and selling products and services by electronic means such as mobile applications and the Internet. It makes it possible to buy and sell products on a global scale, twenty-four hours a day without incurring the same overhead costs associated with a physical store. It can be business-to-consumer (B2C), business-to-business (B2B) or consumer-to-consumer (C2C). When e-commerce is done through mobile devices, it is called "m-commerce", which is a subset of e-commerce. According to the report "UNCTAD e-Commerce index 2018: focus on Africa",[39] in 2016, countries such as the United Kingdom of Great Britain and Northern Ireland, China and Malaysia achieved good results in e-commerce, accounting respectively for 7.3%, 6.9% and 6.4% of their GDP.

63. The performance of e-commerce can be evaluated through the e-Commerce B2C index which is based on i) the percentage of individuals with internet access, ii) the percentage of people having an account with financial institutions, iii) the number of secure servers and iv) the quality of the supply chain. According to available data, Cameroon ranks 10th and Gabon 12th in Africa (2017), out of a total of 44 countries. Other ranks include Rwanda (19th), Angola (29th), Congo (38th), Burundi (40th), DRC (41st) and Chad (43rd). This shows that the e-Commerce B2C

[38] https://www.itu.int/net4/itu-d/icteye/
[39] https://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d12_en.pdf?user=46

performance of several ECCAS countries is below average. Based on the percentage of people who made an online purchase in 2017, Gabon (with 6.1% of the population aged above 15) ranks 6th in Africa.

64. To give a view of the prices charged for mobile telephony, the report published in 2018 by the ITU "Measuring the Information Society", ranks a set of countries of the world, from a reference basket of mobile services (53 minutes of communication and 100 SMS) and its price for 2017. It expresses this price as a percentage of gross national income (GNI) per month and uses it to rank countries ranging from Macao (1st with 0.10%) to Liberia (last with 58.14%). The table below gives an excerpt for ECCAS countries (except Congo and Equatorial Guinea that are not listed for lack of data recorded by ITU). We can see that all the countries in the sub-region are at the tail end of the ranking, which implies that prices in all these countries are high compared with the income level. In addition, the United Nations Commission on Broadband for Sustainable Development established that the price of electronic communications should be less than 5% of monthly GNI in 2015 and 2% in 2025. On the basis of the table below, it appears that the 2015 target was achieved by a single ECCAS country, namely Gabon.

Table 3: Price comparison of mobile telephony in ECCAS

PRICE OF A REFERENCE BASKET (51mn, 100S MS) IN 2017						
RANK	**COUNTRY**	**% GNI**	**US $**	**PPA**	**Tax %**	**GNI US $**
115	Gabon	3.07	16.93	(26/50)	6.61	
136	Angola	5.83	16, 18	20.65	5	3.33
146	Rwanda	7.71	3.75	12.65	28	720
149	Sao Tome & Principe	8.45	12.46	19,97	5	1,770
161	Cameroon	12.02	13.62	33.21	19	1,360
174	DRC	25.2	9.45	23.66	26	450
176	Burundi	30.03	7.26	18.52	18	290
178	Chad	36.02	19		18	630
180	CAR	38.48	12.5		19	390

Source: UIT, 2018 “Measuring the information society report”[40]

65. With the technological evolution that has led to an “all-digital” solution, all the services offered depend on the quality of the data traffic in terms of speed, transmission delay and latency, and availability (ensured inter alia by the redundancy of the links). In many countries, the (low) Internet speed is one of the main limitations to its use.

Startups in Central Africa are still an exception

- In Rwanda, concerning equipment manufacture and marketing, the company MARA phones manufactures smartphones for the regional market.

[40] https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-1-E.pdf

- In Chad, the startup Kouran Djabo was created in 2017 to provide electricity to the poorest families in N'Djamena. It avails them with solar kits that allow them, at least, to light up and recharge mobile phones, for a monthly subscription.

-In Gabon, the startup Easytech offers solutions in the area of consultancy and software integration to administrations and companies since 2012.

- In Cameroon, concerning entrepreneurship and innovation, several startups have emerged, sometimes with established reputation. Such startups include MBOA Store, a 100% African app store that responds to a digital patriotism concern; Kyrio Games, the first African video game developed; Drone Africa, a drone service; NJORKU, a job search engine; GIFTEDMOM, an application for medical monitoring of pregnant women; WAZAPAY, an online payment platform and e-wallet; HImore Medical (Cardiopad); CAYSTY for the initiation of the girl child to ICTs.

The problems faced by startupers range from the lack of support in starting their project, to the difficulties of having technical resources, through lack of funding and the cost and quality of Internet connection.

3.1.2 Electronic communications infrastructure

Low levels of interconnection and very high prices of communications in Central Africa

66. Telecommunication and ICT infrastructure consists mainly of backbone fibre optic networks, which provide a reliable medium for interconnecting the various network nodes, useful for all stakeholders in the sector, be they operators, institutions or companies. Below is a presentation of national and sub-regional infrastructures in turn.

67. Regarding Cameroon, for instance, the national fibre optic ground transport network has a linear length of approximately 12,000 kilometres. Ten out of ten regions, 52 divisions out of 58 and 209 out of 360 sub-divisions have access to the optical fibre. For the other countries, the first-level administrative units (region, province or divisions, as the case may be) have access to the optical fibre for the most part. The rate of access to optical fibre drops for second-level administrative units (divisions, provinces or districts, depending on the country) and decreases significantly for third-level administrative units (sub-division or district). In any case, the use of fibre optic in the access network (FTTH - fibre to the home) is extremely rare and limited.

68. Exchange of local Internet traffic in a given territory requires the physical infrastructures called Internet Exchange Points (IXPs). They improve Internet traffic and avoid significant additional costs of transporting data on international routes. Two ECCAS countries, namely Cameroon and Congo, have two IXPs each. Five countries (Angola, Burundi, Gabon, DRC and Rwanda) each have one IXP. Four other countries do not yet have IXPs. An IXP is intended to allow telecommunications operators, Internet service providers and even content platforms to exchange their local traffic as a member or participant of this IXP. The number of participants per IXP is given in a table attached in Appendix 10. The number varies from 4 to 13 and

suggests that each of the countries with an IXP still have Internet access providers not connected to this equipment.

69. When an IXP connects members in other countries, it is called the Regional Internet Exchange Point (RIXP). Three ECCAS countries (Congo, Gabon and Rwanda) have RIXPs. Congo and Gabon were in turn endorsed by the African Union to host a regional Internet exchange point. However, the low direct interconnection between the ECCAS countries makes it difficult to implement a regional internet exchange point because a RIXP without a direct interconnection link can be compared to a bridge over a water body between neighbouring countries not yet serviced by any road.

70. We will now examine the direct interconnection links between the countries. An example of direct interconnection links between countries is the Central Africa Backbone (CAB) project, an initiative of Central African Heads of State launched in 2008 for the reliable and high-speed interconnection of countries in the sub-region by fibre optic. Expected outcomes include the transformation of the telecommunications landscape in the countries, the transmission of data from one country in the sub-region to another without transit through international submarine cables, an increase in the broadband Internet penetration rate and the dissemination of international connectivity throughout the territory of the States concerned. To date, three direct country interconnections are effective (Cameroon-Chad, Equatorial Guinea-Cameroon and Congo-Gabon). It should be noted that several direct interconnection works are in progress.

71. For their international communications, all countries in the Central African sub-region with a coastline have one or more fibre optic submarine cable landing stations. The CAB project also aims to allow countries of the hinterland to carry out their international communications through these same landing stations from direct interconnection with the country or countries concerned. The list of landing stations or landing points by ECCAS country, possibly with their capacity, is attached in Annex 6. Some countries have multiple landing points (the number of such landing points may be as high as five) and the optic fibre network mesh is expected to switch traffic from one point to another in case of a problem.

72. To secure their transactions, Cameroon, Gabon and Rwanda have put in place a public key infrastructure. Such infrastructure is essential for trust in the digital economy, in that it ensures data security through identification, authentication of partners in their transactions, integrity and confidentiality of data exchanged as well as non-repudiation of messages or transactions. Banking and/or financial transactions, for example, can be done with confidence without the risk of being infiltrated by cybercriminals.

In Central Africa, broadband fibre-optic infrastructure capacity is still weak, as the backbone to link countries still needs to be put in place and the prices of electronic communications are very high, compared with other regions of the world and income level.

73. Many challenges need to be addressed. They include extension of the transport and access to infrastructure for all populations, which is itself linked to the problem of financing, as well as to sub-regional interconnection. Another priority is the continuous need to improve service quality and consumer experience of electronic communications to ensure the availability of 24/7 services in environments where the fibre optic network is sometimes cut while its

redundancy is not always ensured, or even the electricity network is not stable, all without forgetting the quality issues specific to communication.

3.2 National and sub-regional policies

3.2.1 At the national level

74. Some countries already have a strategy for developing the digital economy, while others do not yet have one. The case of some countries will be examined specifically. Concerning **Burundi**, the country has a broadband development plan called "Burundi Broadband 2025". To give substance to Burundi's vision for ICTs, the Government decided to define a broadband policy, which is the routing of multiple formats (voice, video, text and data) on a single channel via at least 256 Kbit/s, which will serve as a path for all ICT players, thus recognizing the socioeconomic importance of broadband services for national development. This plan intends to ensure the availability of the necessary infrastructure to provide quality services to all citizens at affordable rates. Burundi is aware that broadband is considered a staple just like electricity and will have an impact on Industry 4.0 similar to what electricity had during the industrial revolution. Burundi's national broadband plan aims to maximize the socioeconomic benefits of broadband to businesses and citizens through the availability of digital services at affordable prices. Nevertheless, the development of the Internet in Burundi is rather slow. Internet Service Providers (ISPs) are established only in Bujumbura and in some big cities of the interior of the country, thus causing a weak penetration and a digital divide. Thus, considering that ICTs are a cross-cutting sector, generating substantial income and jobs and serving as a basis for structuring, boosting and promoting other sectors such as education, health, trade, public administration, transport and tourism, the Government of Burundi implemented a World Bank-sponsored Communication Infrastructure Project (CIP), a fibre optic transport network (National Backbone) covering the entire national territory. The main actors include the Ministry of Youth, Posts and Information Technologies, the Telecommunications Regulatory and Control Agency, operators (Econet Leo SA, ONATEL, etc.), Internet services and access suppliers, etc.

75. In **Cameroon**, Vision 2035 captioned "Cameroon: an emerging country, democratic and united in its diversity" as well as the ten-year planning document (GESP - Growth and Employment Strategy Paper) gives priority, inter alia, to ICTs and the digital economy. To operationalize this vision in the digital economy sector, a "Cameroon 2020 Strategic Plan" was elaborated in 2016. The vision of the strategic plan is to make Cameroon "a digital country in 2020". To make this vision concrete, the strategic choices made revolve around eight areas each one associated with a strategic objective:

Area 1: "Developing broadband infrastructures", with the strategic objective of generalizing broadband access for citizens, businesses and households.

Area 2: "Increasing the production and supply of digital content", with the aim of having attractive content developed and hosted locally.

Area 3: "Ensuring the digital transformation of government services and businesses", with the goal of accelerating the digital transformation of government services and businesses to boost their efficiency, transparency, competitiveness and productivity.

Area 4: "Promoting the digital culture through a widespread use of ICTs in society".

Area 5: "Strengthening digital trust".

Area 6: "Developing a local digital industry and promoting research and innovation". Its objective is to develop, at national level, digital goods and services produced locally through centres of excellence in digital innovation.

Area 7: "Ensuring human capital development and leadership in digital technology". Digital illiteracy is a major obstacle to the advent of the information society. Accordingly, strengthening human resource capacity is a priority to make Cameroon a digital country in 2020.

Area 8: "Improving governance and institutional support", with the objective of creating an enabling environment for a digital boom to spur economic development. Indeed, the implementation of cross-cutting activities such as adaptation of the legal and regulatory framework, pooling of the necessary financing for the implementation of all the projects identified through innovative financing methods such as venture capital funds are all essential factors for the advent of an inclusive information society in Cameroon. A priority action plan identifies many projects to be executed with a summary cost evaluation.

76. Some target values for measuring progress were set. Accordingly, the contribution to GDP should increase from 5 to 10%, the number of direct jobs from 10,000 to 50,000 and the annual contribution for taxes and duties from 136 billion to 300 billion CFA francs. Among the actors, to take into account the important role of human capital, emphasis is placed on training in universities and engineering schools as well as private higher education institutions.

On the other side, Cameroon's industrialization strategy is reflected in the Industrialization Master Plan adopted in 2017. The plan is intended to lay the solid foundations for an integrated and competitive industrial development, coherent and compatible with the enormous potential of Cameroon's soil and subsoil resources. The targeted leading and promising sectors include agribusiness, energy **and digital technology**. Cameroon aims to increase by 24% against 13% currently, the contribution of the industrial sector in the formation of the country's GDP, in order to attain the objectives of emergence by 2035.

77. The Congo has reaffirmed in the country's vision "Moving towards Development", its commitment to "*align Congo to the development of the digital economy"*. The objective is to create suitable conditions for building a true information and knowledge society in which administration, education, health, trade and many other services use ICTs to equip Congo with a national ICT development policy, focused on e-government, e-citizens and e-business. One of the challenges identified is to mobilize the resources needed to complete national telecommunications coverage, and to give Congolese the opportunity to connect and, by the same token, facilitate the creation of applications and value-added services that should stimulate economic growth, employment and above all, development.

The Congolese government plans to put in place a framework to ensure users' connection to broadband, facilitate the acquisition of computers and make the effective use of information and communication technologies compulsory within government services in order to contribute to the improvement of the socioeconomic environment and to ensure sustainable growth on the basis of an information and knowledge society.

There are plans for actions such as adoption of the national policy for the development of information and communication technologies (cyber strategy), regulator capacity building (ARPCE) or the effective establishment of the Universal Service Fund (USF) as a response to the obligations of access to ICT services for all citizens living in non-economically viable or underserviced geographical areas.

78. In **Gabon**, the Gabon Emergent Strategic Plan (PSGE) gives pride of place to the digital economy. The Gabon Digital Sector Plan of the PSGE plans to make Gabon a country with a digital infrastructure throughout its territory, allowing the development of a wide range of services "promoting a major leapfrogging in social services and the emergence of the pillars of Emerging Gabon". Thus, implementation of the Digital Gabon Programme should lead to significant progress in the following areas: improving access through greater coverage of the national territory, particularly in rural areas, improving service quality, substantial increase in Internet speeds, construction of a national fibre optic backbone, incentives to lower the price of terminals, establishment of a comprehensive ICT legal framework and lower communication costs.

79. The example of the national policy of **Rwanda** is found in the below box.

Box 5: An example of successful digital transformation - Rwanda

Rwanda, a small land-locked country of 26,340 km^2 and a population of 11,900,000 inhabitants, experienced hardship 25 years ago, which did not prevent it from being cited henceforth as a reference in African in the field of the digital economy. The country has a "Vision 2020" compass and a development master plan, the "Smart Rwanda Master Plan 2015-2020". One of the key objectives of Vision 2020 is to transform an agricultural economy into an information and knowledge economy by 2020. Targets in the master plan include:

-24-hours Self-Service in the Administration - All government services will be online in 2018;

-Cashless and Paperless Administration - All financial transactions in the Administration will have to be made electronically, especially via mobile from 2018;

-Achieve efficiencies worth US $ 50 million;

-At least one billion US $ in terms of opportunities for the private sector - This is an estimated value of the cost of projects to be carried out according to the PPP model;

-SMART Rwanda's **contribution to GDP should increase to 10%** - Broadband access and ICT infrastructure projects should provide a breeding ground for economic growth;

-Creation of **100,000 direct jobs** from the investments envisaged by the SMART Rwanda Master Plan;

-An environment conducive to **private investment** will be put in place to allow job creation, productivity improvement and competitiveness, all backed by technological innovation.

The achievements so far are encouraging. Rwanda's tax revenue collected for the 2016/2017 financial year hit a new record of RWF 1,103 billion gross (US $ 1.3 billion) against a target of RWF 1,094.3 billion (US $ 1 billion). This represents an increase of US $ 10 million above the target. At the same time, tax collection increased by RWF 5.4 billion (US $ 6.5 million). Taxes

increased by 10.2% in fiscal year 2016/2017 compared with the 2015/2016 performance, which represents a nominal increase of RWF 100.2 billion ($ 119 million).

In terms of training, the focus is on digital technology, from primary to higher education. With regard to primary education, the One Laptop per Child project, a partnership between two American NGOs whose goal is to put cheap computers in the hands of the poorest young people on the planet, is functional. As such, OLPC distributed more than 200,000 laptops to more than 400 schools across Rwanda, putting the country in third place behind Peru and Uruguay, in terms of computers provided.

In terms of business creation and support to startups, one of the flagship projects set up in this context is the kLab, i.e. knowledge laboratory. It is a unique collaborative space where young entrepreneurs and other engineers can access free WiFi, participate in workshops and conferences, and compete against each other during hackathons, or simply to exchange code tricks. The centre is based on the experience of 21 mentors, available to develop ideas or offer business advice to any new company planning to break into the technology sector.

The klab centre operates in conjunction with the research campus of Carnegie Mellon University, an ITU centre of excellence in the field of training.

Source: "*Smart Rwanda Master Plan, 2015-2020"*[41]

3.2.2 At the sub-regional level

80. The legal and regulatory framework at sub-regional level is defined within ECCAS through model laws to harmonize policies and ensure their coherence. Eight model laws in the digital domain are in force:

- ✓ Model law on the general legal and institutional framework of the electronic communications sector, Brazzaville, November 2016;
- ✓ Model law on access regimes and electronic communication activities, Brazzaville, November 2016;
- ✓ Model law on universal service and its financing mechanisms, Brazzaville, November 2016;
- ✓ Model law on radio frequencies and numbering resources, Brazzaville, November 2016;
- ✓ Model law on interconnection, Brazzaville, November 2016;
- ✓ Model law for electronic transactions;
- ✓ Model law on the protection of personal data;
- ✓ Model law on the fight against cybercrime in ECCAS/CEMAC Member States.

81. However, despite the existence of this legal and regulatory framework, the level of transposition of these model laws in the national legislation of the eleven ECCAS Member States remains low. In fact, it turns out that after the drafting of the model laws, a second phase was planned to support and follow-up their transcription in national laws, but this phase has not really

[41] http://www.minecofin.gov.rw/fileadmin/templates/documents/sector_strategic_plan/ICT_SSP__SMART_Rwanda_Master_Plan_.pdf

started. Moreover, while recognizing that the digital economy relies more and more on data (big data, AI, etc.), most countries do not have a law on the protection of personal data.

82. At the level of sub-regional political bodies, several projects were agreed upon in favour of sub-regional development and integration. These include the Central Africa Backbone (CAB) project, the Consensual Plan for Electronic Communications Infrastructure Deployment in Central Africa (CPECID-AC) and the Cross-Border Frequency Coordination Agreement. In addition, in 2008, at the end of a summit, the Heads of State of the Central African Economic and Monetary Community decided to provide the sub-region with a reliable high-speed telecommunications network to link several countries of the Economic Community of Central African States via a fibre-optic land connection. Expected outcomes include the transformation of the telecommunications landscape in a country, data transmission from one country in the sub-region to another without transit through international submarine cables, an increase in the penetration rate of broadband Internet, the dissemination of international connectivity throughout the territory of the States concerned, and a sub-regional mobile roaming tariff.

CPECID-AC, adopted in March 2019, is a programme to strengthen the community broadband infrastructure of the Member States and the interconnection of broadband infrastructures between the Member States. The Member States community broadband infrastructure strengthening programme will fill the missing links to attain the last interconnection chambers at the borders of the various countries and with the assistance of ECCAS, should help the Member States concerned to raise the funds necessary for their realization.

The implementation of this programme will address the following issues: high communication rates in the sub-region; circumventing traffic from the sub-region to other backbones; the loss of opportunities relating to network externalities; the loss of foreign currency in the sub-region.

83. In the context of electronic transactions, the problem of recognition of electronic certificates issued by the public key infrastructures (PKI) of each country by other countries restricts the security of transactions at national level. In order to guarantee Internet network fluidity and ensure that national or sub-regional traffic does not pass through countries outside the region, a programme for the deployment of national and regional Internet exchange points (IXPs) is in progress under the auspices of the African Union.

84. On the other side, there are coordination and radio frequency sharing agreements in the border areas between certain member States (between Cameroon and Chad, for instance). The agreements include a review of the various conditions and opportunities for sharing channels dedicated to operators and providers of mobile communications services. They set the framework and parameters for network encroachment control in border areas to allow smooth network operation, avoiding mutual interference. The agreements also address the problem of accidental roaming, especially when free roaming is not yet implemented, and lay the groundwork for sharing and coordinating frequencies at country borders to optimize management of the radio frequencies spectrum for all border localities and the development of a coverage map. Unfortunately, the agreements are not generalized to all the countries of the sub-region.

85. **What could be the cause of the almost chronic delay in the sub-region?** The answer cannot be contained in a single sentence, but it is obvious that Central Africa can no longer afford the luxury of remaining a passive player in the face of the challenges of this fourth industrial revolution. Some of the possible causes are the lack of follow-up of the decisions taken by the Heads of State or even those of the sub-regional meetings of the ministers of telecommunications, notwithstanding the security conflicts rocking the sub-region. This observation may explain in part the delay of the sub-region in its regional integration process. Other causes are:

- ✓ A belated implementation of the free movement of goods and persons that became effective only in 2017 in the CEMAC zone, whereas it was initiated more than fifteen years ago;
- ✓ A Consensual Transport Master Plan for Central Africa (PDCT-AC) not implemented, which was adopted in 2004 by the 11th Ordinary Conference of Heads of State and Government of the Economic Community of Central African States (ECCAS), whose objective by 2010 was to link the capitals of the sub-region by paved roads, from one capital to another and therefore to develop sub-regional E-commerce. To this day, it is still to be realized;
- ✓ The absence of a one network (mobile roaming), which has been the subject of several feasibility studies and advocacies initiated in 2009 by ECA and ITU in sub-regional institutions, with a recent start in 2019. To date, there is no roadmap to validate for implementation;
- ✓ A delay in the transposition of ECCAS Community instruments on the model laws relating to telecommunications/ICTs and a reference framework for cross-border interconnection of ECCAS Member States adopted in 2016. To date, most countries have not initiated the transposition process.

86. These four points show how much the sub-region is struggling to implement the decisions taken at Community level, despite numerous working meetings or institutional consultations. Roaming is a perfect example: the instruments were adopted since 2016, but no implementation action is being taken despite its potential to boost sub-regional trade and its role as an integration tool. Central Africa cannot afford to ignore the digital economy.

87. For that purpose, sub regional organizations should, among others, promote a sub-regional digital economy strategy by associating financial partners, international organizations, the public sector and the private sector from the onset in order to prepare the necessary cross-cutting structural reforms, particularly by:

- ✓ Reforming the education and research sector;
- ✓ Strengthening the human capacities of RECs in the field of the digital economy, that are sorely lacking or non-existent in some cases;
- ✓ Partnering with private sector;
- ✓ Defining the fourth industrial revolution as a sub-regional priority in its own right and not as a second-class activity;
- ✓ Binding countries to implement the sub-regional legal reforms adopted by RECs;
- ✓ Developing a harmonized regulatory platform for the digital economy sector that could correspond with the rest of the world;
- ✓ Mainstreaming women in sub-regional digital development policies to close the gender digital divide that continues to widen in Africa;

- ✓ Creating a sub-regional digital solidarity fund to finance startups that will be the employers of tomorrow;
- ✓ Decreasing the costs of access to broadband and hence the costs of access to the Internet and telecommunications.

88. In addition, it would be wise for the Heads of State of the sub-region to set up a technical committee to follow up on decisions taken at statutory meetings (Summits of Heads of State, meetings of thematic ministers of ECCAS/CEMAC...) with a special status enabling it to enforce and control the proper execution of the adopted resolutions.

To assess the impact of the digital economy on GDP or tax revenues, only the mobile sector will be taken into account, owing to low data availability for the other dimensions of the digital economy.

According to GSMA's "Sub-Saharan Africa Mobile Sector Economy 2017",[42] in 2016, mobile technologies and services generated $ 110 billion in economic value in sub-Saharan Africa, or 7.7% of GDP. Mobile's contribution to GDP is expected to rise to $ 142 billion, or 8.6% of GDP by 2020 since countries enjoy an improvement in productivity and efficiency induced by the increase in mobile services subscriptions.

The mobile sector ecosystem also supported 3.5 million jobs in sub-Saharan Africa in 2016. In addition to the impact of the mobile sector on the economy and the labour market, it also makes a significant contribution to the public sector, with $ 13 billion paid in 2016 in the form of taxes.

89. Cognizant of the current situation, the general trends in the digital economy and taking into account the potential of the countries of the sub-region, the main opportunities for the acceleration of economic diversification will be identified by country or group of countries as appropriate, as well as the challenges to be addressed to better harness these opportunities.

4. OPPORTUNITIES AND CHALLENGES OF THE DIGITAL ECONOMY FOR THE ACCELERATION OF ECONOMIC DIVERSIFICATION AND INDUSTRIALIZATION IN THE SUB-REGION

4.1 Opportunities

90. Given that all financial transactions are digitally based, a quality and secure digital base is crucial for their functioning. Financial markets thus need ICTs and can prove useful in raising funds to finance the economy in general, and digital transformation or industrialization activities in particular.

91. The digital economy is an opportunity to considerably increase market size. The market size that was previously associated with the size of a country or the economic community to which it belongs, is now limitless, where 50% of the world's population accessing the Internet

[42] https://www.gsmaintelligence.com/research/?file=0c798a6a56bdb31d4bc3b4ff4a35098d&download

represents about 3.8 billion people. This means that the biggest companies today are not the oil companies, but those referred to as new economies based on platforms that use the Internet to access potential customers located in all countries of the world. Several companies around the world benefit therefrom. The quality and robustness of digital tools, coupled with good human capital, can enable the sub-region to benefit more from the widespread market access offered by the digital economy.

92. Investing in education provides the intellectual resources needed for research and innovation. Similarly, building infrastructure, especially in the area of ICTs, is the foundation for innovation platforms. According to WIPO Magazine, such is the important role that ICTs play in fostering innovation.

93. The digital economy is an opportunity for the public administration to better meet the needs of the citizens. Indeed, e-Government has many advantages such as simplification of procedures, improvement of speed and transparency in the processing of user requests, the fight against corruption, the reduction of cases of theft due to non-handling of cash, etc. The services covered here are numerous and include: the online tax return, the online payment of duties and fines, online business creation, online declaration and obtaining of documents, permits or other documents (birth certificate, marriage certificate, registration certificate, driving license, national identity card, building permit, visa, etc.).

94. Similarly, all countries in the sub-region have on their agenda the ambition to develop the services sector (tourism, trade, financial activities), in short, the tertiary sector as a whole, for which the digital technology is unavoidable.

95. In Central Africa, **the agricultural sector** appears as a sector with favourable prospects in terms of economic diversification and digital technology can help seize growth opportunities in agriculture and agribusiness. Indeed, agricultural needs are numerous and growing, arable land is more or less abundant and digital technology can make a contribution to the various production and marketing phases.

Le numérique pour booster l'agriculture

96. In the production phase, digital technology can contribute to better selection of soil-adapted inputs, better monitoring of crop evolution, control of irrigation or providing the appropriate phytosanitary treatment. Thus, applications cross satellite data and information provided by farmers to identify the varieties best adapted to local soil and climate conditions, as well as the most appropriate phytosanitary treatments. In-ground sensors can provide real-time information on seedling growth and quickly detect anomalies, such as deviations from typical soil quality parameters. In the marketing phase, digital technology ensures marketing, sales (including distance), delivery (GPS) and payment. Three major problems, namely inadequate quantities produced, the low level of local processing and the aging of producers have been identified and must be addressed. Digital technology is an opportunity to provide solutions to these problems, particularly by motivating young people to take an interest in farming. Owing to its traditional image, the agricultural sector is not

immediately associated with digital technologies, but the use of these innovations is rapidly spreading in all fields, including agriculture.

97. In another field, that of agricultural machinery, the integration of digital devices makes it possible to optimize their use. By diagnosing early mechanical failures or providing tailored advice to each user, the cost of running the machines can be reduced. Lastly, regarding marketing, access to market information, suppliers' demands and price, allows to quickly sell the production at the best price while optimizing the management of storage and transport. Also, with the imminent entry into force of the African Continental Free Trade Area (AfCFTA), possibilities for the sale of products are increased tenfold. The sub-region already has a startup for manufacturing drones that can be used for monitoring agricultural production.

Box 6: Use of drones in Tunisia in agriculture

The example of Tunisia using drones to improve agricultural productivity is quite edifying. Indeed, in Tunisia, the African Development Bank (AfDB), the Tunisian Ministry of Agriculture, Water Resources and Fisheries and the South Korean government agency Busan Techno Park signed a tripartite agreement on 8 April 2019 for the deployment of drones in agricultural projects in the Sidi Bouzid region in the centre of the country, as from end April. This pilot project was initiated by the Bank which, through the Korea-Africa Economic Cooperation Fund (KOAFEC), organized the transfer of technologies for the use of drones. The agreement aims to support the Tunisian Government in its policy to improve agricultural productivity. With the introduction of drones, this project will rapidly provide key information that can optimize the use of irrigation systems and fertilizers, detect early diseases that affect agricultural production and, by updating statistical data, improve decision-making during the various phases of the project. A regional centre of excellence will be created in Tunisia to share this experience with other African countries.

Source: Webmanagercenter Article, April 2019[43]

98. **In the forestry sector, the Congo Basin** which covers Cameroon, the Central African Republic, the Republic of Congo, the Democratic Republic of Congo, Gabon and Equatorial Guinea is the second largest tropical forest massif after the Amazon rainforest. It covers more than two million km². It is undergoing over logging and serious deforestation. The damage is ecological with a decrease in biodiversity, though the consequences are also economic with the loss of financial resources, linked to a low processing level, or even no processing at all. Digital technology is a powerful tool for optimal management of forest resources and the creation of value added through processing. The example of Gabon is quite edifying. Recently, the Ministry of Forestry announced the establishment of a national system of forest monitoring through satellite. The purpose of this monitoring system is to prevent activities that may affect forest integrity, but especially to ensure the rational exploitation of the forest. This enhanced monitoring will ensure compliance with the legal provisions provided for in the Forestry Code of the Republic of Gabon, relating to the formulation and monitoring of development plans, for a sustainable management of Gabon's forests. The system will ease the rational exploitation of the forest, wildlife and resources. In addition, the satellite monitoring tool will make it possible to

[43] https://www.webmanagercenter.com/2019/04/08/433405/tunisie-des-drones-agricoles-pour-sidi-bouzid/

map landscapes, particularly the forest and also monitor deforestation or (re)vegetation of the exploited areas.

99. **In the area of financial services,** digital technology has fundamentally transformed activities. The most promising digital finance service in developing countries, in Africa and in ECCAS is Mobile Money. Mobile Money allows people to receive, keep and spend money using a mobile phone. It is sometimes called mobile wallet where we use the name of the service provider such as M-Pesa, EcoCash, GCash, Tigo Pesa, MTN mobile money, Orange money, EU mobile money, etc. Each Mobile Money user has a unique account number and this number is identical to the mobile phone number. Using the mobile wallet menu or app on their mobile phone, users can transfer funds to someone or pay companies such as stores or restaurants or withdraw money from their mobile wallet from agencies in their country. Mobile wallets are a popular alternative to cash and banks because they are easy to use, secure and can be used wherever there is a mobile phone signal. The growth potential of mobile money remains enormous.

100. According to a GSMA report, 40% of the adult population used mobile money in 2016, for a mobile telephony penetration rate of around 65% in ECCAS. If we take into account the fact that this penetration rate will hit 90% in the coming years and assuming a still strong mobile money adoption by individuals and economic actors (comparable to what obtains in Kenya where 90% of mobile subscribers use M-pesa), a simple extrapolation shows that the percentage of the population using mobile money will be around 81%. Mobile money will continue to grow phenomenally, which also bodes well for fintechs.

A contraction of finance and technology, the term fintech is used to describe rather young innovative companies using digital, mobile, artificial intelligence and other technologies to provide cost effective financial services more efficiently. These are usually startups, even though historical payment or banking software players sometimes come up under this term.

101. According to the firm KPMG, fintechs exploded in 2015 with amounts invested by venture capital funds in startups in the sector of up to $ 47 billion that year. In some cases, they take the form of a neo bank, with the possibility of having an open bank account on the Internet and without a physical agency. 100% digital no-agency neo-banks offer a low-cost account and credit card or have personal finance management payment applications, as well as automated property or investment management tools. Some offer financial services to companies, SMEs or major accounts, such as online currency transfer or paperless factoring.

102. Others, like the crowdfunding platforms, connect project leaders, creators, traders, SMEs and private or professional investors (crowdfunding with or without rewards, crowdlending loans to SMEs, or crowdequity for equity financing). Insurtechs in the field of insurance offer comparator services, collaborative insurance, or 100% digital health insurance.

103. It should be noted that innovation is the core of fintech activities. Noting that financial mobile money services are not interoperable, the startup WeCashUp founded by Cédric Atangana, has developed a universal mobile payment gateway for Africa. According to Cédric

Atangana, Africa has more than 155 mobile payment formats. Before the arrival of an application like WeCashUp, e-traders had to integrate these multiple platforms depending on customer requests. A universal gateway like WeCashUp greatly facilitates electronic payments, thanks to the integration of an API (dialogue interface), which will connect the trader to the correct payment standard. Apart from e-traders, WeCashUp works with banks and microfinance players.

104. Still concerning financial services, cryptocurrency, a form of virtual currency, continues to grow in the world, including in Africa and some economists believe that this revolutionary innovation has every chance on the continent. Cryptocurrency knows no boundaries because it depends on the Internet. Transactions are recorded in a distributed database called "blockchain", a set of connected computers that generate a real-time registry. The peculiarity of cryptocurrency lies in the fact that it is not yet regulated by States and does not pass through any intermediary. Transactions are on the Web and can therefore take place anywhere in the world. Some of the

world's leading brands of cryptocurrency include Bitcoin, Litecoin, XRP, Dash, Lisk and Monero, with Bitcoin topping the chart in Africa. Cryptocurrencies could become the new method of financial transaction in the digital age. According to GSMA, there will be 725 million mobile phone users in Africa by 2020 and more Africans will be able to enter the world of cryptocurrency. Governments do not currently regulate crypto-currencies, and this probably promotes their growth. The fact that cryptocurrency users can send money at low cost wherever an Internet connection is available and without the interference of a third party is an advantage that most currencies do not offer.

105. Autonomous cars of tomorrow will be driven by digital tools. Likewise, for better environmental protection, the engine of tomorrow’s cars will be replaced by electric motors with electric batteries. The electric batteries are made from cobalt, a mineral that abounds in the DRC. Smartphone batteries are also made from cobalt and considering the expected growth of the mobile broadband, this is a good sign for the future of cobalt use in the industry. Indeed, 40% of the cobalt produced globally is used in smartphone batteries and those of electric cars. According to a study commissioned by Glencore, the number of such vehicles is expected to exceed 30 million by 2030 and, to meet the needs, the production of cobalt ore should increase by 314,000 tonnes, more than 400% compared with the 2016 level. In the battery sector alone, global demand for cobalt has tripled since 2011 and this trend is expected to continue. It is expected to rise from 46,000 tonnes in 2017 to about 190,000 tonnes by 2026, according to the sector analysis by Benchmark Mineral Intelligence. The DRC produces about 60% of the world's cobalt and is believed to have 50% of the global reserves of this metal.

106. Cobalt production in the DRC is two-pronged. It is exploited by large groups but also by a multitude of small-scale producers, employing some 200,000 people, which poses the problem of judicious exploitation and safety for these people. First, the use of digital tools could optimize the management of various ore extraction sites, ensure the traceability of production, control quantities and increase security at the various sites. However, it is above all industrialization to produce semi-finished or finished products that can create more value added. Digital technology is a powerful tool for optimizing and monitoring the production and automation chain of its various processes, an opportunity that the DRC should seize.

107. Coltan, another ore very valuable by virtue of its use in the electronics industry, is one of those coveted products which are attractive in some parts of Central Africa and especially the DRC. The term coltan is used to refer to columbite-tantalite, a black or red-brown ore from which niobium and tantalum are extracted. It is the latter that makes coltan so useful. Indeed, because of its resistance to heat and corrosion, tantalum produced from coltan is highly sought after in the manufacture of certain electronic components such as capacitors for computers and mobile phones. The electronics sector is estimated to monopolize 60% to 80% of the tantalum market. It is also used in missiles, rockets or even airplanes. It is used in the composition of cobalt and nickel alloys in aeronautics and reactor manufacturing. Global resources of coltan are spread across many countries, particularly Australia, Brazil, China, Canada, Spain and the DRC. The DRC is home to the largest reserves of this mineral, i.e. 60% to 80% of the world's known reserves.

108. However, the DRC is not the only coltan-rich country in the sub-region. Neighbouring Rwanda may also produce coltan, particularly in the Gatumba region. In many cases, coltan mining is illegal and informal, with adverse effects on the local ecosystem, including wildlife, flora and the daily lives of local communities. Since 2012, several actions have been undertaken to rationalize coltan mining. Burundi, Rwanda and especially the DRC have initiated traceability projects to ensure that minerals do not come from conflict zones. Digital tools are very useful and effective for monitoring sites and ensuring the quality and traceability of coltan. Industrialization with digital tools for automating the production and management process will, at least with semi-finished products, make it possible to acquire more wealth through the creation of added value.

109. Call Centres and, in general, remote service delivery is an opportunity arising from the progress made by digital technologies, where such technologies are of quality and if the countries or areas of relocation have a qualified and competitive workforce. A call centre is a set of human, real estate, movable and technical resources which helps remote management of relations between a company and its market (customers). It most often takes place in one or more office space(s) where electronic communications such as phone calls, emails and other message services are distributed. Such calls can be referred to as incoming when they are received by the centre’s client advisers or, conversely, outbound when they are issued by the latter. Many companies rely on call centres primarily for their external relationships but also to optimize their internal interactions. Such is the case with help desks which remotely assist employees. It is also the case for platforms set up to inform employees about their career, rights and obligations. The number of call centres is growing exponentially. Many industrial or service companies today offer their customers a remote telephone access service. There are several possible work organizations: employees at the customer's premises with staff delegation, teleworking and, mainly, in call centres near or relocated in countries with cheaper workforce. Where customer service teams are spread across multiple centres or at home, it is called a virtual call centre. Call centres are the pivot of the customer relations of many companies today. The quality of services rendered to the customer and the reduced cost of this service are one of the recurring topics of call centres. The service is frequently outsourced to service providers who handle calls from multiple partners. Some companies have chosen outsourcing. Companies delegate the handling of incoming calls to call centres because of its numerous advantages: no investments on telephone switchboards, the adaptation that call centres offer to deal with all new or unexpected

situations by making available trained teams and in a very short time, the regulation of customer service operations especially at certain hours: evenings, nights, weekends ... Several sectors use call centres: Internet service providers, telecom operators, electricity operators, banks, etc.

Most ECCAS countries have the potential to seize the opportunities of offshoring call centres in Europe or America on their territory to create jobs for young people who master digital technologies and the languages spoken in these countries, particularly Angola, Cameroon and Equatorial Guinea.

110. The digital sector is constantly evolving and becoming more important because of its positive impacts on all other sectors. Henceforth, mastery of the digital technology will give the possibility to control the other sectors. Since it is an information and knowledge economy, all the power is in the immaterial, the intangible, the data and especially the artificial intelligence and the wealth contained therein. Digital technology has also brought a disruptive economic model where the focus is on the optimal use of a service rather than ownership of the hardware to access it. Thus, there is an ever-growing tendency for individuals and businesses to use hardware or software computing resources without owning them, what is now called cloud computing. The hardware, software and network are hosted by data centres.

111. Cloud computing is a general term to refer to provision of on-demand resources and services via the Internet. It refers to storage and access to data via the Internet rather than via a computer hard drive. It is thus opposed to the notion of local storage, consisting of storing data or launching programmes from the hard disk. Cloud computing is booming. The general public is increasingly using cloud services, especially for video streaming, Internet search or social networks. Likewise, companies are increasingly using cloud tools for their resource management, collaboration and data analysis. The use of cloud applications will grow as well as the development of Data Centres. Also, the rise of the Internet of Things, the emergence of autonomous cars, the growth of smart cities, or the proliferation of connected devices for health will increase the demand for Data Centres. Platforms as services are cloud environments that provide everything needed for the complete lifecycle of cloud applications, from development to delivery. They allow to emancipate themselves from the purchase and maintenance of hardware, software, and hosting. Suppliers of Platforms as Services host the development tools on their infrastructures. Users can access these tools through applications, web portals or dedicated software. This model is used for general software development and many vendors also host the software once it is developed. Software as a service is a cloud-based application launched from remote computers owned and managed by vendors through the cloud. This model is based on the distribution of software applications over the internet. The limits of using the cloud is that you have to trust a third party to store sensitive data. For some people, the local storage used during the last decades remains today superior to Cloud Computing. These people consider that a hard disk can keep data and programs physically close, allowing quick and easy access for users of the computer or the local network. Also, to limit the drawbacks the development of national data centers should be encouraged. Cloud computing has several advantages. It allows individuals and businesses to purchase IT resources in the form of a service, in the same way that electricity is consumed, without having to install and maintain IT infrastructure in-house. The other advantages are self-service supply, elasticity and pay-as-you-go**.** Self-service supply allows end

users to access any on-demand computing resource. Elasticity provides the opportunity to increase or decrease resource consumption according to the needs of the business. Lastly, pay-as-you-go authorizes payment only for the resources consumed. In addition, cloud computing reduces IT access costs, especially for small businesses and low-income users, as is the case in most of the sub-region. It is an opportunity for ECCAS countries to access better quality hardware and software resources they may need, and at reduced cost.

112. Artificial intelligence (AI) is an important strategic issue because it enables machines and software to help solve complex life problems and is the main driver of progress in industry or services. In fact, this new technology is one of the priorities for research, innovation and co-operation in many countries, particularly in developed countries, so much that it was the main theme of the meeting of G7 ICT and Industry Ministers in Turin in 2017. AI is a complex and powerful set of technologies that will affect, or even transform, all sectors and industries, and help society solve some of its most difficult problems. In addition, AI technologies are likely to bring significant productivity gains and thus create new sources of economic growth. Achieving the broad potential of AI technologies will require sound investments in entrepreneurship, education and the labour market to promote the skills and knowledge that will be useful for jobs of the future and adapt to changes in the demand for skills.

113. There is at least one real benefit to the rapid growth of artificial intelligence, namely that this technology does not require the deployment of specific infrastructure. The absence of servers can easily be offset by access to cloud computing. This allows African countries in general and those of ECCAS to benefit from a new possibility and the least leapfrogging. Henceforth, young developers can, all over the continent, innovate on simple applications and bring new solutions. AI will enable countries to respond to their own development issues, particularly in health, urban and rural areas management, accelerated skill training etc. For this, the sub-region will have to remove the constraints related to the development of high-level talents.

114. The growth of the digital market has prompted the emergence of a dynamic and young-led entrepreneurial fabric. It is a novelty on our continent where the career of civil servant had long been perceived as the most desirable. The new generation of "startuppers" can thus be perceived as the symbol of mentality change allowed by the digital technology.

115. In order to better understand the constraints faced by these new entrepreneurs, the UN Sub-Regional Office for Central Africa organized a meeting in Yaounde on 4 July 2019, which brought together private sector (mobile phone companies, startups) and public sector (Ministry of Posts and Telecommunications and regulatory agency) digital economy stakeholders. During the discussions, several young startuppers described the challenges they face and made a number of recommendations for a rapid and sustained development of their activity, namely:

- ✓ Improve/create a specific regulatory framework for startups to reduce administrative bottlenecks for the rapid emergence of the sector;
- ✓ Initiate a vast awareness campaign to introduce digital careers as early as primary school, while popularizing its culture;

- ✓ Facilitate meetings between startups and the private sector by organizing specific forums to create synergies;
- ✓ Facilitate access of startups to public companies and tenders, and promote them within private companies;
- ✓ Consider a partnership between startups and the public sector to facilitate their development and the designing of innovative job-creating projects;
- ✓ Create an investment fund to finance startups in search of financing that would stand as collateral before financial institutions.

116. In addition, AI and the digital technology are an opportunity sector for young Africans because the entry barrier in terms of initial investment cost is relatively low, which makes it possible to enter the market without necessarily raising significant funds. With 75% of the population under 25 years old, Africa also has specific needs in terms of education and training, an issue for which **AI** could be an answer. Indeed, by enabling a robotic and personalized monitoring of learners, **AI** can maximize the potential in countries where lack of public funding creates overcrowded classrooms of sometimes up to 100 learners for a teacher.

Lastly, **AI** should give Africa the means to use its own data, while these are already coveted by the largest multinationals. With the extreme scarcity of data analysts in Africa making its data a largely unused reserve, machine learning and its predictive models will allow this to be handled in an automated manner, by limiting the use of human resources.

117. In the domain of digital technology, the Internet of Things is expanding. The Internet of Things characterizes connected physical objects having their own digital identity and capable of communicating with each other. This network creates a gateway between the physical world and the virtual world. It allows direct and standardized digital identification (IP address, SMTP protocols, http...) of a physical object through a wireless communication system. Connected objects produce large amounts of data, the storage and analysis of which is an integral part of big data. It is widely usable. In logistics, they can be sensors that are used for the traceability of goods for inventory management and routing. In the field of the environment, they are sensors monitoring air quality, temperature, sound level, the state of a building, etc. In home automation, the Internet of Things refers to communicating household appliances, various sensors (thermostat, smoke detectors, presence detectors, etc.), smart meters and connected security systems. In the field of health and well-being, it refers to connected watches, connected wristbands and other sensors monitoring different parameters. The Internet of Things is an opportunity for industries and companies in all sectors. It will provide manufacturing industries solutions that handle manufacturing operations and production asset management. Transport industries will use it for fleet management and freight tracking. Utilities dealers will invest in smart grids for electricity and water, while in the construction sector smart buildings will be used more and more.

118. In most countries of the sub-region, a good part of the population faces enormous difficulties in accessing basic social services, for lack of a civil status document or identity document. For persons with such documents, there are still difficulties of security and traceability. Digital identification is an opportunity to overcome these shortcomings. The issuance of digital identity cards will provide the opportunity to perform any type of social, administrative or economic transaction reliably. It will mainly allow better integration of marginalized or disadvantaged persons.

4.2 Challenges

119. The many opportunities identified should be seized in order to accelerate economic and social development by creating jobs and wealth, improving people's well-being and reducing inequalities. In order to meet these development objectives and taking into account the current situation of ECCAS countries and the population growth rate, it is established that economic diversification and industrialization are the best answer, as the commodity-based economy has shown its limits. As far as diversification and industrialization are concerned, the digital sector is more impactful in that it is transversal and affects all other sectors.

120. However, A set of unfavourable situations hindering the digital transformation and economic diversification that prevent us from seizing the opportunities mentioned above were exposed. They include, in particular:

The lack of a high-level vision statement on the digital economy or a moribund vision when it exists, as well as the digital economy development strategy;

- ✓ Weak coherence of national policies with that of the digital economy development;
- ✓ Weakly harmonized policies on digital economy;
- ✓ The inadequacy of the legal, regulatory and institutional framework;
- ✓ An undeveloped value-added services, content and solutions adapted to the local context and specific needs
- ✓ The weak support to the domestic private sector for greater adoption of the digital economy;
- ✓ The weak synergy of action between the public sector, the private sector, the training and research institutes operating in the field of digital economy;
- ✓ Difficulties in mobilizing funds;
- ✓ The quantitative and qualitative inadequacy of human resources;
- ✓ The qualitative and quantitative shortage in national and sub-regional infrastructures, coupled with the high cost of communications;
- ✓ Weak identification systems that do not cover the entire population, are unreliable and limit people's access to digital services.

Finding appropriate solutions to these adverse situations and anticipating future needs are challenges to be met at various levels to enable the digital economy playing its full role in diversification and industrialization.

121. Regarding the legal, regulatory and institutional framework, the agile, evolving, changing and globalized nature of the digital economy calls for permanent adaptation of legal norms and strengthening of sub-regional, regional and international collaboration. Greater integration in Central Africa is likely to accelerate trade and stimulate the development of digital services.

122. At institutional level, Government services should lead by example by being a digital service provision benchmark. Digital transformation of the administration should be effective and comprehensive and allow the expansion of e-Government for the benefit of people and businesses.

123. Strengthening the technical and human capacity of regulators is necessary to measure and control the quality of services as well as for adequate pricing of services. It should be noted that the sub-region's market is being invaded by terminals of dubious quality and regulators will have to make an effort to regulate the situation, by licensing them.

124. Moreover, incumbent operators offering fixed electronic communication services have a significant drop in subscriber base, while the general trend in the sector is on the rise, which shows their structural inadequacy. The challenge here is to restructure incumbent operators to enable them playing their full role in this new context. Also, cybersecurity concerns make it necessary to provide States with institutions for managing, controlling and responding to such concerns.

125. The digital economy sector is very agile and evolving. There is a very pressing challenge of establishing a consultation framework to adapt thereto. In addition to public and private institutions, a framework for dialogue between the Government, the private sector, academia and the financial community should be set up within a sort of Partnership Board to discuss the prospects and obstacles that hinder the expansion of the digital economy.

126. With regard to the private sector and the business climate, governments, the sub-region faces challenges relating to the scale of uncertainties surrounding investment, which hinders business development and entrepreneurship, especially for the digital economy. In this light, it is essential for the countries of the region, which for the most part, are at the bottom of the "Doing Business" rankings for various reasons, to consider very seriously tackling the obstacles to the attractiveness of the Central Africa destination.

127. Regarding the digital economy ecosystem of the sub-region**,** apart from operators and providers of telecommunication services, ICTs and mobile financial services, the other elements are missing or embryonic. These include the manufacture of terminals and hardware, software publishing or the provision of value-added services. Administrative or fiscal incentives can help these still dormant activities to take off.

128. Regarding the investments and financing, in order to extend coverage and make access and digital services available everywhere and for all, promoting the development of the digital economy requires huge effort. The mobilization of resources to finance investments in the identified priority areas must consider all existing or future possibilities and adapt them to each type of entity. Countries in the region often tend to focus on resource allocation rather than resource mobilization in the conduct of development policies. They should pay more attention to resource mobilization and reinforce this mobilization by promoting domestic savings through borrowing from development finance institutions. Also, financing models based on public-

private partnership are increasingly used in the digital economy sector and should be further explored. Crowdfunding is a niche where startups are very important. Countries should set guidelines for this type of funding. The same applies to cryptocurrencies.

129. With regard to human capital, the current context of globalization, which is more evident in the digital economy, renders obsolete the traditional model of development in which solutions that have been tried elsewhere are transposed in the countries of the sub-region and requires the adoption wherever possible, of strategies that rely on the development of highly innovative differentiated products or technology-intensive niche products. This presupposes the availability of a critical mass of highly qualified human resources. Thus, there is an acute problem of developing human resources at all levels and especially at the level of university and vocational training. The same is true of research centres and technological clusters, where innovation develops. The situational analysis highlighted the region's enormous lack of specialized high-level training facilities and research centres and the very low level of medium and high technology products from the region.

In a context where innovation and technical and technological capabilities are important factors in competitiveness, Central African countries must invest heavily in human capital formation.

130. With regard to infrastructure, coverage and access costs, connectivity has a central role to play in building the information society.

Universal, ubiquitous, equitable and affordable access to ICT infrastructure and services is one of the challenges of the Information Society and should be one of the goals of all stakeholders involved in building it.

Infrastructure also includes access to energy and postal services, which are essential for equipment activation and the logistical aspects relating to the distribution of products and goods in the context of electronic transactions.

131. In addition, achieving the objectives defined in the various international commitments (ITU Strategic Plan for 2020-2023 and SDG9- Industry, Innovation and Infrastructure) and national guidelines (national strategic plan for development of the digital economy) calls for formalization of the framework to promote or help meet the requirements of the information

society. The idea is to face the challenges of multidimensional convergence (multimedia services platform) of broadband infrastructure and trust in electronic communications services.

132. It is common knowledge that sufficient quantity and good quality infrastructure (transport, electricity or electronic communication) is a prerequisite for the development of any economic sector. This is all the more so in the field of the digital economy that electronic communication infrastructures are called "the heart of the digital economy", owing to their importance and role in the smooth functioning of the other components of the digital economy.

133. The situational analysis highlighted enormous challenges in terms of infrastructure. In each of the ECCAS countries, it will be necessary to build infrastructure, including fibre optics, to provide the broadband services that users need. Such infrastructure must be laid out in such a way as to ensure redundancy and be able to function even in the event of failures and therefore be resilient. Efforts should be made to substantially lower costs because it is important to bear in mind that this sub-region has the highest prices in the world, when compared with the monthly gross national income. It is also worth recalling that an ITU survey showed that the main reasons people do not use the Internet are speed (not fast enough) and high price. Sub-regional interconnection should continue to be a priority and emphasis laid on operational aspects, as the situational analysis noted for instance, that for the past ten years that the CAB project is ongoing, it focused mainly on the regulatory and institutional aspects. This regional interconnection is vital as regional exchange points cannot have their full effect if there is no direct interconnection between countries. In addition, sub-regional interconnection is further incentive for the implementation of free roaming because communications between two countries of the sub-region will no longer have to borrow third-party networks that induce additional charges. As such, to take into account the global trend towards the use of cloud computing, the construction of national data centres as well as secure transaction infrastructures will ensure the digital sovereignty of countries and instil trust in the use of digital tools, in a context of increasing cyber threats.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

134. Most ECCAS countries have given ICTs and the digital economy a prominent place in their long-term and medium-term vision and development policy. In some countries, this vision is reflected in national strategies for the development of the digital economy, as advocated at international and continental levels, but whose deadline has either already elapsed or should soon elapse. In other countries, such strategies are either not available or at best are still being formulated.

135. From examples and concrete cases, we have shown that digital tools are a catalyst for development on which Central Africa should rely for its economic diversification and industrialization. Although digital tools refer to technology, the development of the digital economy is not only at the technological level and the conditions for its expansion are indispensable factors for economic transformation and diversification through industrialization, which the 2016 World Bank report referred to as analogue complements of digital technology. A review of this environment led to the conclusion that it should be adapted, and its harmonization strengthened at sub-regional level.

136. The digital revolution brings a new economic activity organization model with tools to transform production, management and marketing processes through unrestricted access to markets and the simplification of all kinds of procedures. States should not be left behind and need to implement or complete their digital transformation for the advent of e-Government in order to better provide public services to the population and businesses in the best conditions of efficiency, transparency and cost. In this context, although digital transformation is a cross-cutting issue that concerns all actors in society and the economy (State, private sector, non-governmental organizations), the role of the State remains central because it can, among others, serve as an example.

137. In the field of fixed telecommunications infrastructures, ECCAS countries had in the past a considerable delay when communications were mainly fixed. Since the advent of mobile electronic communication, significant progress has been made in many countries, helping to reduce some of their lags (leapfrogging). However, with the digital economy now relying on high speed or broadband networks, there is a risk of further delay, given the underdevelopment of fibre optic networks from which existing (4G for mobile or FTTH for fixed) or future (5G for mobile) high speed services will interconnect, hence the need to invest in the development of such networks.

138. Economic diversification may benefit from the phenomenal growth in digital financial services such as mobile money. Indeed, from 2016 to 2020, the percentage of the adult population using mobile money in sub-Saharan Africa will rise from 40% to about 81%, i.e. more than double. This is an opportunity that greatly contributes to the goal of financial inclusion. However, disadvantaged populations who are not affected by digital services are often the same who do not access identification services (e.g. civil status registration services) and

digital identification can be a solution to generalize identification services, making them more reliable.

139. Technological changes, particularly the transition from 4G to 5G in mobile electronic communications coupled with the need for national the networking of countries by fibre optic backbones and direct interconnection between countries, require enormous efforts to be made in terms of infrastructure, including data centres and dedicated security equipment. Such infrastructures are all the more important as digital service platforms cannot function without them. Apart from human resources, infrastructures are the essential link in the digital services development chain. In the context of infrastructure development, the enormity of the task is such that all possibilities must be explored, including the search for public-private multi-stakeholder partnership or donor support, by reinventing operational processes and mechanisms. This is all the more so since the example of the CAB project set up more than ten years ago with the help of donors has not yet produced many concrete and tangible results. Throughout the value chain, from infrastructures to digital services and other value-added services, through the applications developed by startups, the problem of financing arises and should be addressed taking into account the peculiarities. The issue of crowdfunding and cryptocurrencies need to be considered.

5.2 Recommendations

140. The following recommendations are the results of the above conclusions and are addressed in turn to States, regional economic communities, international organizations, the private sector, universities, institutions of higher learning and donors. They aim to better leverage the digital economy to meet the challenges of the sub-region, including transformation, diversification and industrialization.

141. To Member States:

- ✓ Develop and/or update national strategies to develop the digital economy by drawing up coherent and coordinated industrialization and diversification policies.
- ✓ Update the statutory and regulatory framework, taking into account new digital services centred on platforms and data.
- ✓ Transpose the sub-regional (model laws on the digital economy), regional (African Union Convention on cybersecurity and personal data protection) or international legal standards into national legislation.
- ✓ Pursue, complete and/or promote the digital transformation of the public administration to provide quality public services with speed and transparency to the population and businesses, and facilitate the digital transformation of the private sector, taking into account the enormous gains induced by new and future technologies (cloud computing, artificial intelligence).
- ✓ Promote training, research and innovation, especially in the field of digital technologies and services, through research centres or technology hubs (technopoles or cyberpark, like the Kigali Innovation City of Rwanda), in order to support the development of companies and entrepreneurship.

- ✓ Establish a digital identity system, building on existing regional initiatives such as that of ECA, to take into account all segments of the population and facilitate electronic transactions.
- ✓ Take administrative or fiscal incentives, such as the establishment of preferential economic zones, for companies with high technological or digital value to accelerate the development of manufacturing production (agro-industries or mining industries) and benefit from the combined advantages of the digital economy and the continental free trade area.
- ✓ Consider special measures to increase digital inclusion, and correlatively financial inclusion.
- ✓ Explore all possibilities (strengthening regulation, the role of competition, partnerships, innovative financing) to be leveraged to develop broadband infrastructures (fibre optics, 4G and 5G), increase national and sub-regional connectivity, improve service quality, build trust in the use of digital tools (guarantee of digital sovereignty), in order to make the sub-region more attractive to investors.
- ✓ Take all appropriate measures to make Internet access (considered a public good - Wifi in public places) an inalienable right as access to water, healthcare or security, to allow the entire population benefiting from the advantages of digital technology.
- ✓ Put in place policies, strategies and measures to reduce national and roaming tariffs (free roaming) for digital services in order to make them affordable, including to the most disadvantaged.

142. To Regional Economic Communities

- ✓ Continue harmonization of the sub-regional regulatory framework, taking into account new digital services centred on platforms and data.
- ✓ Support States in the transposition of the sub-regional (model laws on the digital economy), regional (African Union Convention on cybersecurity and personal data protection) or international legal standards in national legislation.
- ✓ Like the "Made in Central Africa" label instituted at the 2017 ICE meeting to promote production within ECCAS, consider establishing another label to highlight and/or reward initiatives having a strong impact on digital inclusion.

143. To International Organizations

- ✓ Provide support for the formulation and/or updating of national digital economy development strategies.
- ✓ Provide assistance to Member States in transposing sub-regional (model laws on digital economy), regional (African Union Convention on Cybersecurity and Personal Data Protection) or international legal standards in national legislation.
- ✓ Continue to support or expand their support to regional human resource development projects and initiatives to reduce the digital divide, including through STEM programmes.
- ✓ Support Member States in the implementation of a digital identity system that will prove unavoidable in the future.

- ✓ Develop a best practice guide on innovative financing (crowdfunding or others and virtual currencies) that will guide the relevant choices.

144. To the private sector

- ✓ Undertake or continue their digital transformation in order to sustain and develop their activities, otherwise companies that have not made their digital transformation risk disappearing.
- ✓ Seize the immense opportunities offered by digital technologies to develop new products and services, and to realize industrialization projects and benefit from the combined advantages of the digital economy and the Continental Free Trade Area.

145. To universities and institutions of higher learning

- ✓ Put in place training curricula in the field of future digital technologies and develop partnerships, particularly with the private sector, to conduct research and provide answers to national and sub-regional issues.
- ✓ Networking to pool resources and create a topical thematic specialization by country that allows skill development in all countries of the sub-region.

146. To donors

- ✓ Contribute to financing digital economy development by proposing adapted solutions taking into account its agility and scalability, as well as the specificity of the players in the various market segments.
- ✓ Establish or increase partnerships with engineering schools, universities and research centres to support the development of quality human resources that are the main driver for the development of digital technologies.

BIBLIOGRAPHY

1. "*Analyse des drivers de l'économie numérique"*, Mawenzi Partners, March 2013

2. Statistical Yearbook of Telecommunications and ICTs in Cameroon, 2017 edition, MINPOSTEL-INS

3. Atlas, mapping mining and SDGs

4. Global cybersecurity index 2017, ITU

5. ICT4SDG: Leveraging technology to achieve the global goals

6. Information economy report 2017: digitalization, trade and development, UNCTAD

7. Innovating in the Digital Economy, Global Information Technology Report 2016, World Economic Forum

8. Global Competitiveness Index, World Economic Forum, 2017-2018

9. Global Information Technology Report 2016, World Economic Forum

10. ITU News magazine, No. 3/2017, "How ICTs accelerate the achievement of the SDGs"

11. The Mobile Economy, Sub-Saharan Africa 2017, GSMA

12. Measuring the information society report, ITU publication 2018

13. 2017 Observatory of the Electronic Communications Market in Cameroon, ART

14. WIPO Magazine: ICTs and Innovation, September 2013

15. Cameroon Digital 2020 Strategic Plan

16. UNCTAD Information Economy Report 2015: "Unlocking the potential of e-commerce for developing countries"

17. World Development Report: Digital dividends, World Bank, 2016

18. United Nations e-Government survey 2018

19. UNCTAD B2C E-commerce Index 2018, f*ocus on Africa*

GLOSSARY

AfCFTA: African Continental Free Trade Area
AXIS: African Internet eXchange System
B2C: Business to Consumer
CAGR: Compound Annual Growth Rate
CIS: Community of Independent States
EAC: East African Community
ECA: United Nations Economic Commission for Africa
ECCAS: Economic Community of Central African States
ECOWAS: Economic Community of West African States
GAFAM: Google, Apple, Facebook, Amazon, Microsoft
GDP: Gross Domestic Product
GDR: Gross Domestic Revenue
DERD: Domestic Expenditure on Research and Development
GSMA: Global System for Mobile Communication Association
ICE: Intergovernmental Commission of Experts
ICT: Information and Communication Technology
ITU: International Telecommunication Union
IXP: Internet eXchange Point
LDC: Low Development Countries
M2M: Machine to Machine
MSMEs: Micro, Small and Medium Enterprises
OECD: Organization for Economic Cooperation and Development
OS: Operating System
OTT: Over The Top
PKI: Public Key Infrastructure
PPP: Purchasing power parity
REC: Regional Economic Community
SADC: Southern African Development Community
SDG: Sustainable Development Goal
SRO-AC: Sub-Regional Office for Central Africa
STEM: Science, Technology, Engineering and Mathematics
UNCTAD: United Nations Conference on Trade and Development
UNESCO: United Nations Education, Scientific and Cultural Organization
WEF: World Economic Forum

ANNEXES

Annex 1: Definition of terms used in the report

3D printer: Machine intended for the manufacture of parts in 3 dimensions by depositing successive layers of molten material (plastic, metal, food, etc.) and making it possible to produce real objects.

5G: Mobile communications technology with faster data rates (in terms of gigabits per second), reliable connectivity, ultra-low latency, improved energy efficiency, increased security and a high number of people and connected devices.

Artificial Intelligence (AI): Set of theories and techniques implemented to enable machines, and more particularly computer systems, to simulate human cognitive processes. Such processes include learning (acquiring information and rules relating to their use), reasoning (applying rules to arrive at rough or precise conclusions) and self-correction. Specific AI applications include expert systems, voice recognition and artificial vision.

Backbone: Network core encompassing network nodes and transmission arteries.

Big data: Significant volumes of various kinds of data, quickly accessible, processed and transmitted at high speed and whose analysis allows us to extract useful information in many fields such as consumer behaviour, epidemiology, the fight against crime, etc.

Blockchain: Distributed databases containing lists of all user-to-user transactions since they were started. Each transaction list is contained in a block that is linked to the next, forming a chain. The scope of blockchains is very wide and they can replace most centralized third parties (banking professions, notaries, land registries, etc.).

Broadband: Synonymous with high speed.

Cloud computing: Use of remote servers accessible by Internet to store, access or process information, from several workstations of various types (computer, smartphone), in lieu of the user's workstation.

Cryptocurrency: Electronic currency that can be exchanged peer-to-peer on a blockchain or decentralized network or distributed registry and whose implementation is based on the principles of cryptography to validate transactions and generate the currency itself.

Data centre: Secure building that houses computer applications or communication equipment. It is equipped with rooms that follow strict standards (electricity, temperature, humidity, access control, etc.) to preserve the life span of the equipment.

Fintech: These are companies, usually startups, that operate in the field of technological innovation applicable to financial and banking services. Their scope of action ranges from alternative financing of companies to online payment, through savings management, loans, bank accounts aggregators, etc. Their goal is to provide customers with best and cheaper services. Fintech therefore has a disruptive approach to the world of banking, finance and insurance.

Industry 4.0: New generation of connected, robotized and intelligent factories for the manufacture of unique and customized products, adapted to the needs of each customer.

Insurtech: Companies relying heavily on technological activities to create value in automotive, home, life insurance and other professional guaranty products and gain market share in the insurance market.

Internet eXchange Point (IXP): Physical infrastructure that allows the exchange of local Internet traffic in a given territory. This improves Internet traffic quality and avoids the significant extra costs of transporting data out of the territory, country or continent.

Internet of Things: Network of objects connected by means of the Internet or any other ICT infrastructure, allowing the exchange of information and data coming from devices present in the real world and from everyday life (watches, household electrical appliances and home automation ...) or in the virtual world.

Machine to Machine (M2M): Communication between two or more machines and requiring little or no direct human intervention.

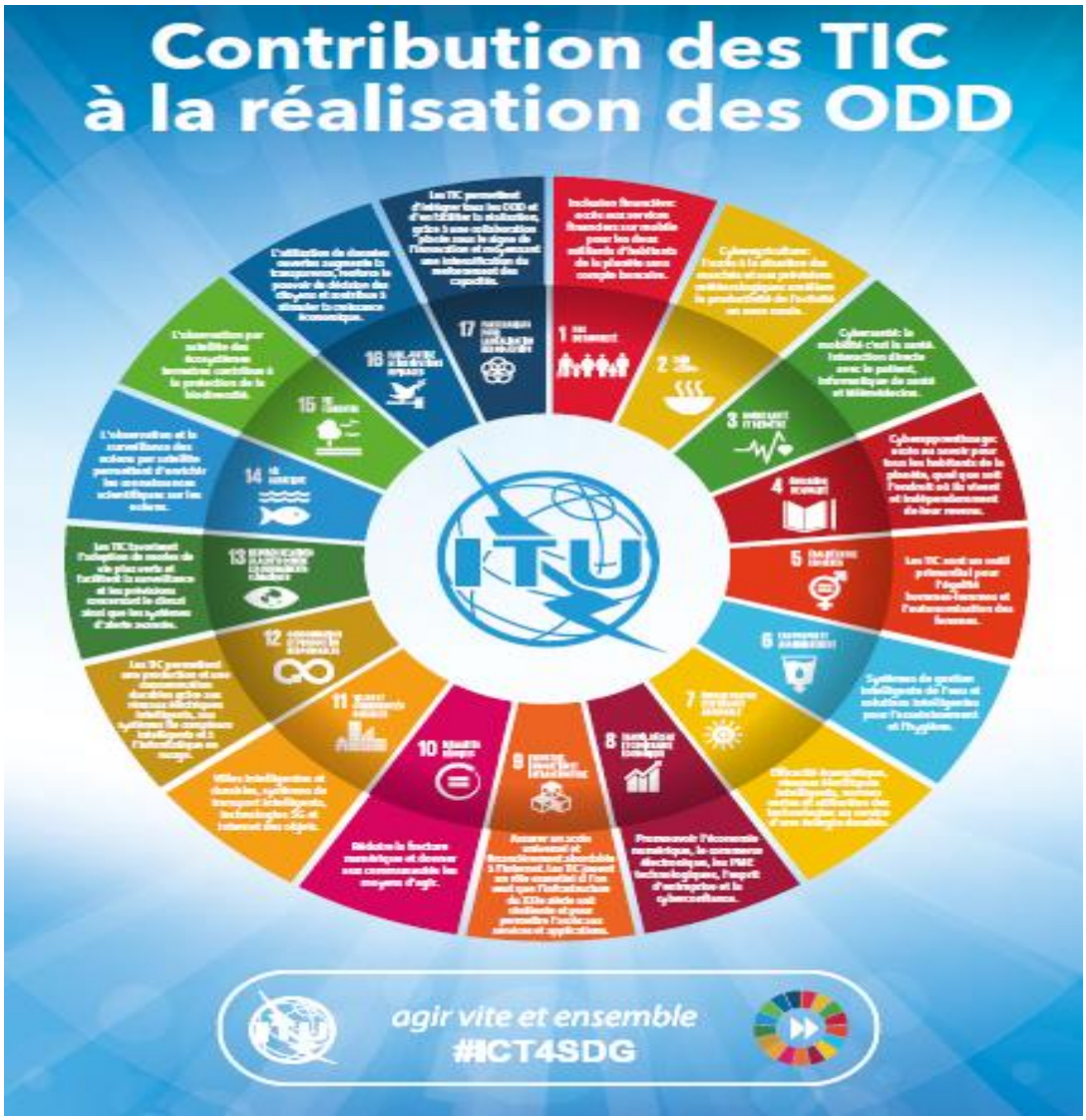
Over the top (OTT): Applications and services that are accessible over the Internet and that rely on the network of telecom operators while being independent of them, and to concurrently provide voice and messaging services, among others.

Startup: Young company, generally in the technology sector, with a potential for a strong and rapid growth, and having completed at least one round of external financing.

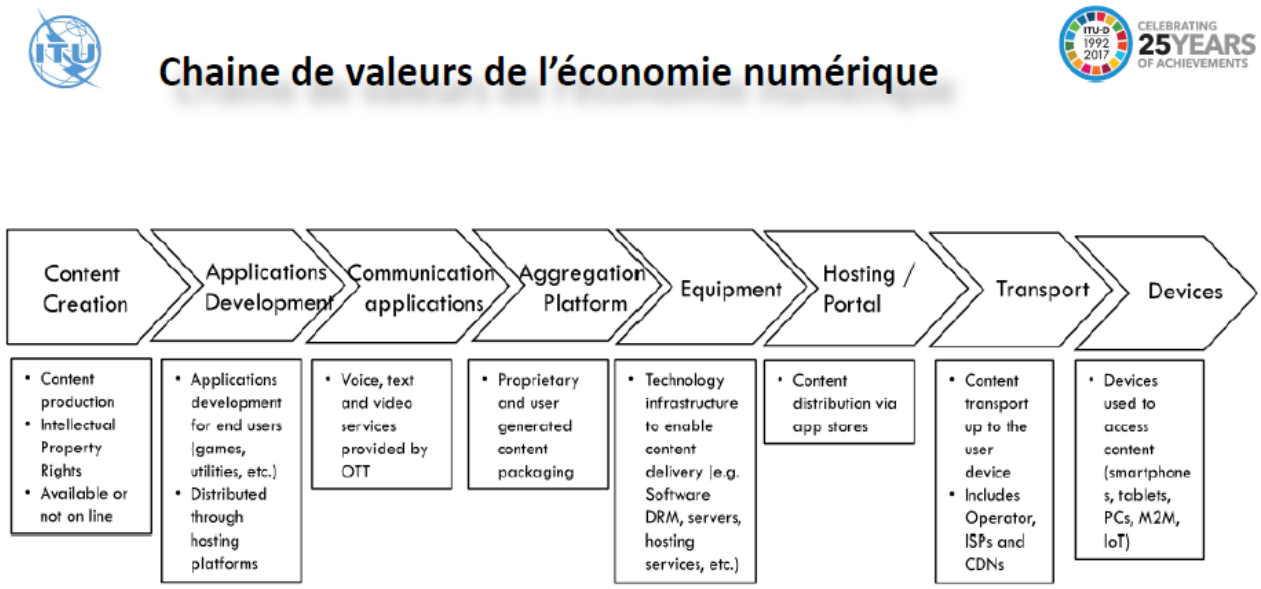
STEM: Science, technology, engineering & mathematics

Very high speed: Bitrate greater than a few dozens of megabits per second (Mbps). For the European Union, it is 30 Mbps.

Annex 2. Contribution of ICTs to the achievement of SDGs



Annex 3: Digital economy value chain



Source: UIT

Annex 4: Major Engineering Schools (or Universities), Research Centres and Online Courses in Africa

No.	Country	Major Schools	Certificates issued	Research Centres	Online Course Certification
1	Angola	Universidade Catolica de Angola	Professional BSc		
2	Burundi	University of Burundi	Masters Doctorate		
3	Cameroon	National Advanced School of Posts, Telecoms and ICTs (SUP'PTIC)	Professional degree/ Construction Engineers -Masters/Design Engineers Doctorate		Cisco CCNP CCNA
4		National Advanced Polytechnic School of Yaounde	Masters/Design Engineers Doctorate		Cisco CCNP CCNA
5		Polytechnic Institute of Maroua	Masters		
6		Faculty of Industrial Engineering, Douala	Bachelor's degree Masters Doctorate		
7		African Institute of Computer Sciences (IAI)	Professional degree Masters		
8		Department of Computer Science and Networks in the Faculties of Science of each of the eight State Universities	BSc Masters Doctorate		
9		Cameroon-Congo Inter-State Higher Training School for ICT (Sangmélima Campus and Ouesso Campus)	Engineers		
10	Gabon	African Institute of Computer Science	Design Engineer		
11	Ghana	Ghana Technology University	Bachelor of science		

		College	Masters		
12		Accra Institute of Technology	Professional degree Masters Doctorate		
13	Nigeria	Digital Bridge Institute	Masters Doctorate		E-learning
14	Côte d'Ivoire	African Higher School of ICT (ESATIC)	Engineer Masters Doctorate		E-learning CISCO CCNA Microsoft IT Academy
15 16	Kenya	African Advanced Level Telecommunications Institute (AFRALTI) Mount Kenya University	Engineer Masters Bachelor Masters Certificate Diploma		Cisco & IT CCNA Security Huawei CISCO CCNA E-learning
17		Technical University of Kenya	Diploma Bachelor	Science, Engineering, Technology and Entrepreneurship Research Centre	E-learning
18		Strathmore University	Bachelor Masters Diploma	10 research centres	E-learning
19	South Africa	Centre for learning Telkom	Masters Doctorate		Cisco CCNA
20	Rwanda	University of Rwanda, College of Science and Technology (URCST)	Professional degree Masters Doctorate		E-learning
21		Kigali Independent University (ULK)	Bachelor Masters		E-learning
22		Carnegie Mellon University	Engineer Masters		
23		Adventist University of Central Africa	Bachelor Masters		E-learning
24	Chad	Emi Koussi University	Bachelor Masters		
25	Senegal	Cheikh Anta Diop Universities of Dakar: Higher Polytechnic School of Dakar	Higher Diploma of Technology (DST) Professional degrees Diploma of Technology Engineer (DIT) Design Engineer Diploma (DIC) Masters Doctorate	Computer, Network and Telecommunications Laboratory	
26		ESMT	Professional degree Construction Engineers Professional Masters Doctorate	e-INOV ESMT laboratory	VSAT CCN Alcatel-Lucent Equipment Optical fibre NSOFT Online courses
27		Higher Institute of Training/Management Engineering and Technology	Professional degree Professional Masters		IT Pro Online courses

Annex 5: Interconnection rates in ECCAS countries - ITU Tariff Policies Survey - results 2018

Country	Termination rates on incumbent fixed network: Local Level	Termination rates on incumbent fixed network: Single Transit	Termination rates on incumbent fixed network: Double Transit	Termination rates on other fixed networks: Local Level	Termination rates on other fixed networks: Single Transit	Termination rates on other fixed networks: Double Transit	Termination rates on mobile networks: Fixed to Mobile	Termi tion ra on mo netwo Mobil Mobil
Angola	0.02	0.60E-2	0.01	0.03	0.60E-2	0.01	0.03	0.03
Burundi	0.02							
Cameroon	0.05	0.02	0	0	0	0	0.05	0.05
Central African Rep.								
Chad	0.11[2]	0.11[2]	0.28[2]				0.35[2]	0.06[2]
Congo (Rep. of the)	0.07						0.05	0.05
Dem. Rep. of the Congo								0.03
Equatorial Guinea								
Gabon	0.02	0.86E-2					0.02	0.02
Rwanda	0.48E-2	0.48E-2		0.48E-2	0.48E-2		0.48E-2	0.01
Sao Tome and Principe							0.04[1]	0.06[1]

Year: 2018 or latest available data.

[1]2017. [2]2012. [3]2015. [4]2014. [5]2011. [6]2016.

Source: ITU World Tariff Policies Database

Annex 6: List of landing points in ECCAS countries and their capacity (most recent years)

	Landing Point 2		Landing Point 3		Landing Point 4		Landing Point 5		Landing P	
bps)	Name	Capacity (Gbps)	Name	Capacity (Gbps)	Name	Capacity (Gbps)	Name	Capacity (Gbps)	Name	C
	ACE		SACS		WACS (ongoing)					
	WACS	280	NCSCS (MAIN ONE)	40		SAIL	2800		ACE (ongoing)	

	ACE									
	ACE		CEIBA-2	40	SAIL (ongoing)					
	ACE									
	ACE									

Luanda - Fortaleza 6,300 km

Annex 7: Rate of penetration of the fixed telephone in ECCAS countries, 2017

Country	ISO	Fixed (wired)-broadband subscriptions per 100 inhabitants	Fixed-telephone subscriptions per 100 inhabitants
Angola	AGO	0,3	0.54
Burundi	BDI	0	0.22
Cameroon	CMR	0,1	3.68
Central African Rep.	CAF	0	0.04
Chad	TCD	0,1	0.07
Congo (Rep. of the)	COG	0	0.32
Dem. Rep. of the Congo	COD	0	0
Equatorial Guinea	GNQ	0,3	0.88
Gabon	GAB	0,6	1.05
Rwanda	RWA	0	0.10
Sao Tome and Principe	STP	0,6	2.73
TREG: ITU World Telecommunication/ICT Regulatory Database - TP: ITU World Tariff Policies Database			
ITU ICT-Eye: http://www.itu.int/icteye			

Annex 8: Rate of penetration of the telephone and mobile broadband, World and ECCAS, 2017

Region	Country	Mobile-broadband subscriptions per 100	Mobile-cellular subscriptions per 100 inhabitants
Central Africa	Angola	14.6	44.73
	Burundi	12.6	54.5
	Cameroon	17.7	83.71
	Central African Republic	4.7	25.23
	Chad	22.6	42.66
	Congo	5.9	96.11
	Democratic Rep. of Congo	16.2	43.49
	Equatorial Guinea	0	44.66
	Gabon	84	131.51
	Rwanda	35	72.24

	Sao Tome & Principe	34	85.14
ECCAS AVERAGE		**22.48**	**65.82**
WORLD AVERAGE		**62**	**103.60**

Annex 9: Rate of penetration of the Internet, percentage of homes with Internet access and percentage of home with a computer, ECCAS, 2017

Country	ISO	Households with a computer (%)	Households with Internet access at home (%)	Individuals using the Internet (%)
Angola	AGO	11.89	11.30	14.34
Burundi	BDI	3.24	3.32	5.59
Cameroon	CMR	16.90	21.70	23.20
Central African Rep.	CAF	2.91	3.03	4.34
Chad	TCD	3.30	3.44	6.50
Congo (Rep. of the)	COG	5.73	2.97	8.65
Dem. Rep. of the Congo	COD	3.11	3.20	8.62
Equatorial Guinea	GNQ	15.76	9.27	26.24
Gabon	GAB	34.66	40.98	50.32
Rwanda	RWA	2.50	9.30	21.77
Sao Tome and Principe	STP	16.72	19.63	29.93

TREG: ITU World Telecommunication/ICT Regulatory Database - TP: ITU World Tariff Policies Database

ITU ICT-Eye: http://www.itu.int/icteye

Annex 10: Number Internet exchange points by ECCAS country

Country (IXP name)	ISO	2017	Number of members	2017 Repository
Angola (ANG-IX)	AGO	1	13	
Burundi (BDIXP)	BDI	1	11	ICT-Eye TP
Cameroon	CMR	2	8	ICT-Eye TP
Central African Rep.	CAF	0		
Chad	TCD	0		
Congo (CGIX)	COG	2	4	ICT-Eye TP
Dem. Rep. of the Congo (KINIX)	COD	1	10	ICT-Eye TP
Equatorial Guinea	GNQ	0		
Gabon (GAB-IX)	GAB	1	6	
Rwanda (RINEX)	RWA	1	7	
Sao Tome and Principe	STP	0		

Source: TREG: ITU World Telecommunication/ICT Regulatory Database - TP: ITU World Tariff Policies Database
ITU ICT-Eye: http://www.itu.int/icteye

Annex 11: Table. UNCTAD B2C E-commerce Index, 2018, Africa

	Economy	Share of individuals using the Internet (2017 or latest)	Share of individuals with an account (15+, 2017 or latest)	Secure Internet servers (normalized) (2017)	UPU postal reliability score (2017 or latest)	Index value (2017 data)	Index value change (2016-17 data)	World Rank
1	Mauritius	55	90	56	66	66.9	-7.2	55
2	Nigeria	42	40	52	85	54.7	5.5	75
3	South Africa	59	69	83	0	52.9	-1.9	77
4	Tunisia	56	37	51	63	51.7	2.1	79
5	Morocco	62	29	54	59	50.9	NA	81
6	Ghana	39	58	45	53	48.8	7.6	85
7	Kenya	39	82	37	27	46.2	3.7	89
8	Uganda	17	59	31	58	41.5	-3.2	99
9	Botswana	47	51	41	26	41.4	0.1	100
10	**Cameroon**	23	35	25	78	40.3	3.6	101
11	Namibia	31	81	46	0	39.5	-4.9	103
12	**Gabon**	62	59	34	0	38.9	5.1	104
13	Libya	20	66	64	0	37.6	NA	107
14	Senegal	46	42	24	34	36.8	4.5	108
15	Zimbabwe	31	55	34	26	36.7	1.2	109
16	United Republic of Tanzania	25	47	32	42	36.5	8.0	110
17	Algeria	43	43	41	18	36.3	0.5	111
18	Egypt	45	33	36	23	34.4	2.3	113
19	**Rwanda**	20	50	31	30	32.7	-5.1	116
20	Djibouti	13	12	32	20	30.2	13.5	119
21	Togo	12	45	19	41	29.6	-2.3	121
22	eSwatini	29	29	36	23	29.0	1.8	122
23	Sudan	28	15	12	59	28.7	14.7	123
24	Côte d'Ivoire	44	41	25	0	27.6	-10.6	124
25	Lesotho	27	46	31	4	27.2	1.3	126
26	Zambia	24	46	38	0	27.0	2.4	127
27	Madagascar	10	18	20	54	25.6	-4.2	129

	Economy	Share of individuals using the Internet (2017 or latest)	Share of individuals with an account (15+, 2017 or latest)	Secure Internet servers (normalized) (2017)	UPU postal reliability score (2017 or latest)	Index value (2017 data)	Index value change (2016-17 data)	World Rank
28	Mali	11	35	23	25	23.9	-0.6	131
29	**Angola**	13	29	26	26	23.9	-4.7	132
30	Burkina Faso	16	43	12	22	23.4	1.8	133
31	Malawi	11	34	26	18	22.3	2.2	134
32	Mozambique	18	42	23	0	20.8	NA	137
33	Benin	12	38	18	11	20.1	4.7	138
34	Mauritania	18	21	18	21	19.6	0.3	139
35	Ethiopia	15	35	4	17	17.8	-0.4	141
36	Sierra Leone	12	20	11	20	15.9	-0.9	143
37	Liberia	7	36	12	7	15.6	-2.1	144
38	**Congo**	8	26	19	3	14.3	-2.7	145
39	Comoros	8	22	20	0	12.5	-7.5	146
40	**Burundi**	5	7	19	15	11.8	1.8	147
41	Congo, D.R.	6	26	14	0	11.7	-1.0	148
42	Guinea	10	23	10	2	11.4	-0.9	149
43	**Chad**	5	22	2	0	7.4	0.7	150
44	Niger	10	16	0	0	6.6	2.4	151

Source: UNCTAD.

Annex 12: Table: Mobile-cellular basket, 2017

Rank	Economy	Mobile-cellular basket			Taxe rate included (%)	GNI, USD, 2017
		% of GNI	USD	PPP$		%
1	Macao, China*	0.10	5.65	6.97	0	65,130
2	Hong Kong, China	0.15	5.73	6.93	0	46,310
3	Singapore	0.17	7.92	9.32	7	54,530
4	Austria	0.17	6.63	6.89	20	45,440
5	United Arab Emirates	0.19	6.10	7.99	0	39,130
6	Estonia	0.22	3.38	4.95	20	18,190
7	Slovenia	0.24	4.45	5.86	22	22,000
8	Lithuania	0.26	3.27	5.64	21	15,200
9	Sweden	0.26	11.58	10.33	25	52,590
10	Iceland	0.27	13.84	9.16	24	60,830
11	Norway	0.28	17.66	13.91	25	75,990
12	Sri Lanka	0.30	0.94	2.84	50	3,840
13	Finland	0.30	11.22	10.23	24	44,580
14	Germany	0.31	11.26	12.02	19	43,490
15	Iran (Islamic Republic of)	0.34	1.53	4.26	9	5,400
16	Cyprus	0.35	6.91	8.72	19	23,719
17	Qatar	0.36	18.40	23.73	0	61,070
18	Brunei Darussalam	0.36	9.00	15.69	0	29,600
19	Luxembourg	0.40	23.18	20.43	17	70,260
20	China	0.40	2.91	5.11	0	8,690
21	Costa Rica	0.45	4.11	6.26	13	11,040
22	Switzerland	0.45	30.21	21.04	8	80,560
23	United Kingdom	0.46	15.44	14.96	20	40,530
24	Latvia	0.46	5.62	8.67	21	14,740
25	Ireland	0.49	22.54	20.09	23	55,290
26	Australia	0.54	22.99	18.71	10	51,360
27	Kuwait	0.54	14.14	21.82	0	31,430
28	New Zealand	0.55	17.95	15.41	15	38,970
29	Italy	0.56	14.54	15.96	22	31,020
30	Russian Federation	0.58	4.45	10.44	18	9,232
31	Bahrain	0.59	10.00	16.33	0	20,240
32	Mauritius	0.61	5.13	9.10	15	10,140
33	Croatia	0.64	6.60	11.00	25	12,430
34	Egypt	0.68	1.70	11.01	23	3,010
35	Romania	0.68	5.63	12.04	19	9,970
36	Malaysia	0.70	5.63	14.59	6	9,650
37	Kazakhstan	0.70	4.63	13.27	12	7,890
38	Maldives	0.71	5.67	7.30	6	9,570

39	Canada	0.74	26.39	25.27	13	42,870
40	Netherlands	0.74	28.47	28.29	21	46,180
41	Oman	0.75	9.00	17.36	0	14,440
42	Bahamas	0.77	18.79	16.46	8	29,170
43	Denmark	0.78	35.89	28.13	25	55,220
44	Malta	0.83	16.55	22.47	18	23,810
45	Japan	0.84	26.96	28.22	8	38,550
46	Saudi Arabia	0.84	14.13	27.38	0	20,080
47	Mongolia	0.86	2.36	6.81	10	3,290
48	Poland	0.87	9.19	18.46	23	12,710
49	Belgium	0.88	30.72	31.07	21	41,790
50	Turkmenistan	0.88	4.89		15	6,650
51	United States	0.90	43.55	43.55	9	58,270
52	Mexico	0.91	6.51	12.18	19	8,610
53	Armenia	0.91	3.04	7.46	20	4,000
54	Belarus	0.92	4.06	16.16	25	5,280
55	Greece	0.92	13.93	18.27	39	18,090
56	Tunisia	0.93	2.72	7.94	24	3,500
57	Spain	0.94	21.28	25.64	21	27,180
58	Azerbaijan	0.94	3.20	14.54	18	4,080
59	Bhutan	0.97	2.19	6.40	5	2,720
60	Slovakia	0.99	13.64	22.12	20	16,610
61	Portugal	1.02	16.84	22.11	23	19,820
62	Andorra**	1.02	31.49			36,987
63	France	1.08	34.20	34.96	20	37,970
64	Seychelles	1.09	12.94	20.45	15	14,180
65	Czech Republic	1.10	16.61	27.19	21	18,160
66	Chile	1.10	12.48	17.79	19	13,610
67	Israel	1.13	35.13	28.62	17	37,270
68	Libya	1.15	6.29		0	6,540
69	Jordan	1.16	3.83	8.20	46	3,980
70	Sudan	1.23	2..43		35	2,379
71	Korea (Rep. of)	1.23	29.10	32.77	10	28,380
72	India	1.24	1.88	6.12	18	1,820
73	Panama	1.24	13.59	23.02	7	13,100
74	Namibia	1.28	4.90	10.35	15	4,600
75	Hungary	1.28	13.74	25.25	27	12,870
76	Trinidad and Tobago	1.29	16.46	19.68	13	15,350
77	Uruguay	1.39	17.64	21.59	22	15,250
78	Bangladesh	1.39	1.71	4.31	21	1,470
79	Uzbekistan	1.39	2.30		20	1,980
80	Georgia	1.47	4.65	13.71	21	3,790
81	Jamaica	1.56	6.16	9.88	25	4,750
82	Thailand	1.57	7.79	20.62	7	5,960
83	Brazil	1.58	11.28	16.40	40	8,580
84	Botswana	1.61	9.13	18.04	12	6,820

85	Myanmar	1.61	1.60	6.38	5	1,190
86	Montenegro	1.61	9.86	20.05	19	7,350
87	Paraguay	1.82	5.94	12.85	10	3,920
88	South Africa	1.84	8.33	17.68	14	5,430
89	Albania	1.87	6.72	14.36	20	4,320
90	Saint Kitts and Nevis	1.88	25.10	32..85		16,030
91	South Sudan*	1.94	0.63	4.66	13	390
92	Argentina	1.99	21.68		21	13,040
93	Ghana	2.03	2.51	7.79	24	1,490
94	Indonesia	2.03	5.99	16.09	10	3,540
95	Kenya	2.11	2.53	5.62	26	1,440
96	Peru	2.15	10.71	20.13	18	5,970
97	Pakistan	2.19	2.88	9.46	32	1,580
98	Lebanon	2.32	16.07	26.66	10	8,310
99	Ukraine	2.34	4.65	20.92	20	2,388
100	Dominican Rep.	2.40	13.27	28.36	30	6,630
101	Nauru	2.43	20.71		15	10,220
102	Algeria	2.47	8.15	23.56	19	3,960
103	Viet Nam	2.52	4.56	11.25	10	2,170
104	Antigua and Barbuda	2.55	30.12	37.17	15	14,170
105	Turkey	2.56	23.30	52.99	43	10,930
106	Suriname	2.61	13.11	30.23	8	6,020
107	Barbados	2.64	34.15	27.84	18	15,540
108	The Former Yugoslav Rep. of Macedonia	2.64	10.73	25.49	18	4,880
109	Colombia	2.72	13.23	28.48	23	5,830
110	Bosnia and Herzegovina	2.80	11.53	24.88	17	4,940
111	Tonga	2.81	9.39	12.72	15	4,010
112	Iraq	2.84	11.30	22.10	0	4,770
113	Philippines	2.96	9.02	23.02	12	3,660
114	Grenada	2.96	23.77	31.94	15	9,650
115	Gabon	3.07	16.93	26.63		6,610
116	Ecuador	3.07	15.09	24.87	12	5,890
117	Samoa	3.14	10.74	14.62	15	4,100
118	Serbia	3.34	14.41	31.34	20	5,180
119	Lao P.D.R.	3.53	6.67	17.16	10	2,270
120	Guyana	3.60	13.38	21.07	14	4,460
121	Tajikistan	3.61	2.98	10.92	23	990
122	Saint Lucia	3.77	27.56	35.35	15	8,780
123	Nepal (Republic of)	3.91	2.58	7.35	24	790
124	Bolivia (Plurinational State of)	3.96	10.32	20.77	13	3,130
125	Dominica	3.99	23.24	31.87	15	6,990
126	Bulgaria	4.00	25.84	60.39	20	7,760
127	Moldova	4.06	7.37	19.90	20	2,180
128	Fiji	4.25	17.61	28.34	9	4,970
129	Kyrgyzstan	4.26	4.01	13.34	17	1,130
130	Ethiopia	4.73	2.91	7.38	15	740

131	Saint Vincent and the Grenadines	4.73	27.54	38.26	2	6,990
132	Morocco	4.77	11.37	26.22	20	2,863
133	Nigeria	4.87	8.45	20.90	5	2,080
134	El Salvador	5.27	15.63	30.35	18	3,560
135	Marshall Islands	5.56	22.22		0	4,800
136	Angola	5.83	16.18	20.65	5	3,330
137	Micronesia	5.89	17.63		0	3,590
138	Palestine	5.90	15.63	22.10	16	3,180
139	Cambodia	6.68	6.85	16.88	10	1,230
140	Guinea	6.90	4.71	10.78	11	820
141	Kiribati	6.96	16.12			2,780
142	Zambia	7.04	7.63	19.38	34	1,300
143	Yemen*	7.23	6.21		5	1,030
144	Honduras	7.49	14.05	28.08	15	2,250
145	Belize	7.56	27.68	48.57	13	4,390
146	Rwanda	7.71	4.62	12.65	28	720
147	Lesotho	7.81	8.33	23.76	5	1,280
148	Mozambique	8.32	2.91	9.53	17	420
149	Sao Tome and Principe	8.45	12.46	19.97	5	1,770
150	Solomon Islands	8.92	14.26	14.35	10	1,920
151	Vanuatu	9.19	22.35	20.46	13	2,920
152	Haiti	9.30	5.89	13.46	10	760
153	Guatemala	9.34	31.61	53.42	12	4,060
154	Timor-Leste	9.41	14.04	21..50		1,790
155	Afghanistan	10.09	4.79	15.69	0	570
156	Cabo Verde	10.33	25.74	55.09	15	2,990
157	Papua New Guinea	10.65	21.39	26.08	10	2,410
158	Uganda	10.96	5.48	16.39	18	600
159	Côte d'Ivoire	11.21	14.38	35.60	18	1,540
160	Djibouti	11.32	17.73	30.13	10	1,880
161	Cameroon	12.02	13.62	33.21	19	1,360
162	Benin	12.37	8.25	21.49	18	800
163	Sierra Leone	15.14	6.43	20.60	15	510
164	Madagascar	15.32	5.11	17.72	20	400
165	Senegal	15.62	12.37	30.60	23	950
166	Tanzania	15.89	11.99	33.01	33	905
167	Nicaragua	16.03	28.44	75.95	15	2,130
168	Comoros	16.46	10.43		0	760
169	Zimbabwe	17.72	13.44	26.48	25	910
170	Mauritania	19.11	17.52	45.96	18	1,100
171	Burkina Faso	19.49	9.91	26.41	18	610
172	Mali	19.60	12.58	33.46	18	770
173	Togo	20.15	10.24	25.50	18	610
174	Dem. Rep. of the Congo	25.20	9.45	23.66	26	450
175	Malawi	27.39	7.30	25.74	17	320
176	Burundi	30.03	7.26	18.52	18	290
177	Guinea-Bissau	31.46	17.30	41.28	17	660

178	Chad	36.20	19.00		18	630
179	Niger	36.82	11.05	29.12		360
180	Central African Rep.	38.48	12.50		19	390
181	Liberia	58.14	18.41	23.37	14	380
Syrian Arab Republic***			2..57		0	-
Somalia***			3.54		10	-
San Marino***			14.57	16.77	0	-
Cuba***			21.46		0	-
Liechtenstein***			27.59		8	-
Monaco***			28.16		20	-

Source: ITU. GNI p.c. and PPP$ values are based on World Bank data.
Note: Palestine is not an ITU Member State; the status of Palestine in ITU is the subject of Resolution 99 (Rev. Dubai, 2018) of the ITU Plenipotentiary Conference.
* Data correspond to the GNI p.c. (Atlas method) in 2016.
** Data correspond to the GNI p.c. in 2016, sourced from the United Nations Statistics Division (UNSD).
*** Country not ranked because data on GNI p.c. are not available.