

# Africa Digital Economy Development Index and China-Africa Digital Economy Cooperation Report

2024



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DataSparkle



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## Abbreviations

- AfCFTA**- African Continental Free Trade Area
- AISI** - African Information Society Initiative
- APP** -Application
- EU** - European Union
- G20** - Group of Twenty
- GDP** - Gross Domestic Product
- GSMA** - GSM Association
- ICT** - Information and Communication Technology
- ILO** - International Labour Organization
- IMF** - International Monetary Fund
- IPO** - Initial Public Offering
- ITU** - International Telecommunication Union
- LDCs** - Least Developed Countries
- LLD** - Landlocked Developing Countries
- NTIA** - National Telecommunications and Information Administration
- OECD** - Organisation for Economic Co-operation and Development
- PIDA** - Programme for Infrastructure Development in Africa
- SIDS** - Small Island Developing States
- UN** - United Nations
- UNCTAD** - United Nations Conference on Trade and Development
- UN-Habitat** - United Nations Human Settlements Programme
- UPU** - Universal Postal Union
- WB** – The World Bank
- WIPO** - World Intellectual Property Organization

## Summary

The digital economy is becoming a key driver of global economic growth, playing an important role in spurring economic recovery, boosting labor productivity, cultivating new markets and new industrial growth areas, and pursuing inclusive and sustainable growth. Africa, known as the “youngest continent”, boasts tremendous potential for the development of the digital economy. Nowadays, African countries develop the digital economy as a key measure to achieve sustainable, diversified and inclusive economic and social development. However, due to geographical, social, cultural and other restraining factors, the use of and access to digital technology obviously vary among different regions and groups in Africa. Unbalanced development of the digital economy must not be overlooked, and it is urgent to narrow the digital development gap.

China has made remarkable achievements in the development of the digital economy, ranking second in the world in terms of digital economy scale for many years. China has also amassed rich experience in bridging the digital divide, and promoting the digital transformation of industries, among others. General Secretary Xi Jinping has stated many times that China is ready to foster exchanges and cooperation with other countries in the digital field and share the development opportunities from the digital economy. The Belt and Road Initiative will promote digital connectivity as an important means to embrace digitalization and tap the tremendous of the digital economy in the implementation of the United Nations 2030 Agenda for Sustainable Development.

In recent years, China and Africa have achieved notable results in conducting pragmatic cooperation in digital economy, bridging the North-South digital divide and eradicating “digital poverty”, which create new opportunities for both sides to achieve inclusive economic growth and digital transition. At the 8th Ministerial Conference of the Forum on China-Africa Cooperation (FOCAC) held in Dakar, Senegal, in November 2021, the “Digital Innovation Program” was included into the “Nine Programs” jointly implemented by China and Africa. During the 3rd Belt and Road Forum for International Cooperation held in October 2023, China, together with Kenya, Ethiopia and other developing countries, jointly issued the *Beijing Initiative on the Belt and Road International Digital Economy Cooperation*. Centering on the theme of “developing the digital economy and tapping new drivers of economic growth”, the participating countries reached consensus on 20 areas such as “increasing digital connectivity and building digital Silk Road” in terms of infrastructure, industrial transformation, digital capability, cooperation mechanisms and other areas.<sup>1</sup> The digital economy has become an important area for win-win China-Africa cooperation.

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<sup>1</sup> The High-level Forum on Digital Economy of the 3rd Belt and Road Forum for International Cooperation, *Beijing Initiative on the Belt and Road International Digital Economy Cooperation*, <http://lu.china-embassy.gov.cn/chn/zgyw/202310/P020231019680044766978.pdf>.

## **Goals and objectives**

This report is jointly released by China-Africa Economic & Trade Research Institute and DataSparkle Big Data and AI Laboratory, supported by the Hunan Provincial Department of Commerce. The writers of this report are mainly from Hunan University. The aim is to study the characteristics and development status of development of Africa's digital economy, analyze the key areas of China-Africa cooperation in digital economy, and put forward suggestions for cooperation at the national and enterprise levels, thereby promoting bilateral win-win results through the development of the digital economy.

## **Content framework**

Centering on the theme of development of Africa's digital economy and China-Africa digital economy cooperation, the African Digital Economy Development Index and China-Africa Digital Economy Cooperation Report (2024) systematically observed and analyzed the characteristics of development of Africa's digital economy, and discussed the current status and path of China-Africa cooperation in the digital field. The report is divided into four chapters:

### **Chapter I African Digital Economy Development Index**

A systematic evaluation framework featuring “space, multiple domains and time” is established for the digital economy. It comprehensively describes the characteristics of the development of Africa's digital economy through an integrated index system and a system coordination degree model. Based on the results of mathematical analysis, this report analyzes the multi-level digital divide in Africa, the coordination of the evolution of Africa's digital economy, the developments of digital finance and digital consumption markets in Africa, and the characteristics of the development of Africa's city-level digital economy.

### **Chapter II China-Africa Cooperation in Digital Economy**

On the basis of analyzing the history of China-Africa cooperation in the field of digital economy, it sums up the achievements and difficulties in China-Africa cooperation in the field of digital economy, and cites the cases of China-Africa Development Fund, Shenzhen Transsion Holdings Co., Ltd. and other enterprises to demonstrate the depth and scope of China-Africa digital economy cooperation in various fields.

### **Chapter III Development of Kenya's Digital Economy and China-Kenya Digital Economy Cooperation**

It summarizes the current development and characteristics of Kenya's digital economy, traces the history of China-Kenya cooperation in digital economy, and demonstrates the significant achievements of China-Kenya digital cooperation by summarizing the localization services of Changsha Kilimall Information Technology Co., Ltd. (Kilimall) in Kenya, Huawei's cooperation with M-Pesa in aiding the development of inclusive finance in Africa and other cases.

### **Chapter IV Suggestions for China-Africa Cooperation in Digital Economy**

Based on the results of comprehensive evaluation of African countries' digital economy, it classifies the development of African countries' digital economy by characteristics, identifies the priorities of China-Africa digital economy cooperation, explores the overall direction of China-Africa digital economy cooperation at the national and enterprise levels, and recommends course of action.

## **Paths and methods**

The writers of this report used literature analysis, comprehensive index evaluation and case analysis to draw relevant conclusions by gathering authoritative data and materials from multiple sources. The materials used for literature analysis include, but are not limited to, policy documents, research papers, and materials from industry participants, well-known institutions, multilateral and regional financial organizations. Macro data used for the construction of composite indices are obtained from official institutions such as the World Bank, the International Monetary Fund, and the International Labor Organization. The micro-data are obtained from the DataSparkle database.<sup>1</sup> The information on enterprises included in the report is obtained mainly from the China-Africa Business Council, the China-Africa Development Fund and relevant public information, and most of the selected enterprises have reputation and are representative in the field of China-Africa digital economy cooperation.

## **Views and conclusion**

### **Characteristics of the development of Africa's digital economy**

- Africa's digital economy has broad potential, but its development varies significantly from region to region, and its systemic imbalance and "multi-level" digital divide should be worthy of attention.
- In terms of digital finance, African countries exhibit different levels of development, and some countries show a mismatch in development from different dimensions of digital finance, showing tremendous growth potential. Traditional finance is the foundation of digital finance development in Africa, while fintech is a key driver of transformation.
- In terms of digital consumption, the capacity of digital consumption scenarios becomes the primary driver of digital consumption in Africa. Entertainment, games and social media have become popular applications.
- As the cities embrace digitalization, Lagos and Cairo are the "bellwether" of major African cities for smartphone users. Educational mobile apps are gaining traction. Data traffic is still the most popular means for using mobile network compared to Wi-Fi.
- Based on the results of comprehensive evaluation of Africa's digital economy, the sample countries stated in the report can be divided into "leading-coordination" countries, "catch-

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<sup>1</sup> The platform is the first data insight platform focused on Africa. It systematically scopes the African market to help global enterprises, investors, and developers stay abreast of market trends, understand consumer feedback, identify and track opportunities, and devise promotional strategies to drive business growth.

up-coordination” countries, “catch-up-adjustment” countries and other categories.

### **China-Africa cooperation in the digital economy**

- China and Africa have carried out across-the-board cooperation in the fields of digital infrastructure, digital applications, digital technology innovation and other areas, and have achieved results in the current stage, demonstrating the tremendous potential and vitality of South-South cooperation.
- In the new stage of development, China should still place an emphasis on Africa’s ability to independently develop the digital economy, pay close attention to the needs of African countries in terms of digital economy development, and foster cooperation in the field of digital economy in a gradient manner on this basis.

### **Policy proposal**

Based on the analysis of the development trend of Africa’s digital economy and the discussion of current China-Africa cooperation, the report explores China-Africa digital economy cooperation in terms of macro path and recommended course of action:

In terms of overall path, it is suggested that China and Africa strengthen top-level planning, deepen cooperation in digital economy; foster cooperation in digital infrastructure and facilitate the development of Africa’s digital economy; expand digital applications and promote use of digital technologies for industries as well as digital industrialization; explore innovation ecosystems to enhance Africa’s innovation capabilities in digital economy; narrow the digital divide, and build an inclusive environment for the development of the digital economy.

In terms of recommended course of action, cooperation with African “leading-coordination” countries in the digital economy should focus on digital infrastructure upgrading, smart cities, cooperation in technological innovation, digital consumption, innovation in financial business form as well as ecosystem building. Cooperation with “catch-up - coordination” countries should focus on improving the quality of digital infrastructure, the exchanges and training of digital professionals, digital consumption, financial markets and development of urban digital service scenarios. In the cooperation with “catch-up – adjustment” countries, it is necessary to pay attention to the “weaknesses” in the evolution of their digital economic systems, focus on narrowing the digital divide, improve the effective supply of digital consumption and financial scenarios, and prize the inclusive value of the digital economy.

# Chapter I African Digital Economy Development Index

*As global digital and information technology constantly make breakthroughs and industrial digitalisation keeps making new progress, digital economy has become a major force in promoting global economic development. Africa gradually realizes the importance of digital economy to optimize economic structure and achieve leapfrog development. In recent years, African countries have actively explored the fields of digital economy and made certain achievements in digital economy development, but there is a great disparity among them in digital economy due to population size and density, economic development environment, geographic location and other factors. This chapter details the history and background of Africa's digital economy development, and evaluates digital economy development level of a number of African countries from multiple dimensions, such as space, industrial field and time, from which we analyze the development status of Africa's digital economy.*

## 1.1 The History and Background of Africa's Digital Economy Development

### 1.1.1 Establish a Digital Connection: The Origin and Early Challenges of Africa's Digital Economy Development

From a global perspective, digital economy is originated from the revolution of information technology from which the former is derived. It intertwines with all aspects of economic and social development from which a new technological and economic paradigm is generated and evolved. However, the development of Africa's digital economy is different from this evolving process. Africa is the second largest continent in the world with the most developing countries, and 33 of them make the list of the Least Developed Countries released by the United Nations Conference on Trade and Development (UNCTAD). Apart from that, seven of them are small island developing countries and the remaining twelve countries are landlocked developing countries<sup>1</sup>. When the IT revolution of Africa started, the continent was deemed as a “borderland area” without economic value and political interest by information capitalism due to its weak economic foundation and lack of information resource supply. In 2005, the world's average landline telephone ownership rate was 19.1%, but the figure in Africa was only 1.5%. In the same year, the world's average internet penetration rate was 15.6% and the number in developed countries was 58%, but only 2% in Africa<sup>2</sup>.

This phenomenon is called “digital divide” by some researchers to represent the disparity of individuals, families, enterprises and regions with different social and economic levels in seizing ICT opportunities and using ICT<sup>3</sup>. The early version of “digital division” mainly refers to the non-equivalence of information allocation among different groups and highlights the

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<sup>1</sup> ITU, “ICTs, LDCs and the SDGs, Achieving universal and affordable Internet in the least developed countries”, <https://www.itu.int/hub/publication/d-ldc-ictldc-2018/>.

<sup>2</sup> ITU's global and regional ICT statistics, [https://www.itu.int/en/ITU-D/Statistics/Documents/facts/ITU\\_regional\\_global\\_Key\\_ICT\\_indicator\\_aggregates\\_Nov\\_2022\\_revised\\_15Feb2023.xlsx](https://www.itu.int/en/ITU-D/Statistics/Documents/facts/ITU_regional_global_Key_ICT_indicator_aggregates_Nov_2022_revised_15Feb2023.xlsx)

<sup>3</sup> Organization for Economic Co-operation and Development (OECD), “Understanding the digital divide”, <http://www.oecd.org/sti/economy/understandingthedigitaldivide.htm>

disparity of accessing digital device by different groups. The significant “digital divide” in Africa has caused extensive attention from the international community, and a series of international initiatives to promote ICT development in undeveloped countries and address global “digital divide” have been frequently released since then. For example, at the World Summit on the Information Society held in Tunisia in 2005, many representatives of developing countries clearly stated the importance of addressing the “digital bridge”, and asked giving more opportunities and approaches for the impoverished countries to access ICT and creating a “mutual-support digital fund” to bridge the digital divide. The early cooperation between China and Africa in the fields of digital economy also focused on the construction of the continent’s ICT infrastructure and addressing the digital divide. In the Forum on China-Africa Cooperation Beijing Action Plan (2007-2009) adopted at the Third Ministerial Conference of the Forum on China-Africa Cooperation in 2006, the essential role of infrastructure construction for Africa’s development was mentioned, and the infrastructure construction in communication, electricity and other fields were considered as the important areas of the bilateral cooperation. The competitive Chinese communication enterprises were encouraged to participate in the related infrastructure construction in the African countries, which significantly supports the efforts made by these countries in building an information society and bridging their digital divide<sup>1</sup>.

Africa also recognized its dilemma of being gradually marginalized by the IT revolution during this period. The United Nations Economic Commission for Africa drafted the African Information Society Initiative (AISI) in 1995, which was adopted at the next year’s African ministerial meeting and accepted by the Organization of African Unity (the predecessor of African Union) summit. The core content of building “national information and communication infrastructure” was universally accepted by the first African Development Forum in 1999, which played an important role in setting priorities by different countries in formulating their domestic digital technology policy for a period since then<sup>2</sup>. The five major goals for addressing Africa’s digital divide were proposed at the Connect Africa Summit in 2007: building the broadband networks connecting the capital and major cities of the African countries to strengthen Africa’s connection with the rest of the world; enhancing the broadband network and information and communication service penetration in the rural areas; supporting the development of knowledge economy related to ICT; constructing ICT capability-building and training center<sup>3</sup>. The African Union adopted the Programme for Infrastructure Development in Africa (PIDA) in 2012 in which the construction of the infrastructure related to ICT was deemed as one of the important construction contents. 114 ICT infrastructure projects were deemed as the flagship projects in the Agenda 2063 released by the African Union in 2015 in order to upgrade the key internet exchange points and build new broadband optical fiber infrastructure and improve the current optical fibre terrestrial backbone networks<sup>4</sup>.

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<sup>1</sup> Forum on China-Africa Cooperation Beijing Action Plan (2007-2009), [http://www.focac.org/zywx/zywj/200909/t20090917\\_8044399.htm](http://www.focac.org/zywx/zywj/200909/t20090917_8044399.htm)

<sup>2</sup> Jiang Lu, Wu Yunong; Technology Promotes Development: The Development and International Cooperation of ICT in Africa, *Fudan Public Administration Review*, Vol 2, 2021

<sup>3</sup> ITU, [https://www.itu.int/en/ITU-D/Conferences/connect/Documents/Post%20Connect%20Africa%20Summit%20Report%20\(English\).pdf](https://www.itu.int/en/ITU-D/Conferences/connect/Documents/Post%20Connect%20Africa%20Summit%20Report%20(English).pdf)

<sup>4</sup> African Union, “Goals & Priority Areas of Agenda 2063”, <https://au.int/agenda2063/goals>

In recent years, thanks to the attention given by the African countries and the international organizations, Africa's digital infrastructure has been greatly improved, and its digital connectivity has been enhanced. According to the data provided by the International Telecommunication Union, Africa's internet penetration rate (by individuals) has improved from 2% in 2005 to 37.1% in 2023. The percentage of population covered by 3G network has improved from 22.2% in 2010 to 83.6% in 2023. According to the Africa Infrastructure Development Index released by the African Development Bank, the average information and communication infrastructure index of African countries has steadily risen from 15.7 in 2005 to 29.39 in 2022<sup>1</sup>. At present, the African continent is gradually moving into the stage of 5G network deployment and market-oriented applications as many countries and regions have rolled out and updated their policy to support 5G-based service development. But it is worth noting that, compared to the rest of the world, there is still a large disparity in Africa's digital connection. Expanding the affordability of digital infrastructure and increasing the overall digital service penetration rate are still the key points and difficulties in Africa's digital infrastructure construction.

### **1.1.2 Accelerate the Integration of Digital and Real Economy: A Leapfrog Development of Digital Economy for Africa in the 21st Century**

African countries have updated their ICT infrastructure, which lays a foundation for their digital economy development, but the existence of their "digital divide" not only represents the gap in internet connectivity between them and the rest of the world, but also indicates the disparity of the capabilities to develop digital economy. Since the beginning of the 21<sup>st</sup> century, the connotation of digital divide has changed from the inequity of digital service access to the differences in digital service usage and the capability of using such services<sup>2</sup>. As to the history of Africa's digital economy development, the inherent social and economic foundation in Africa affects its digital economy development, and the continent still has major deficiencies in digital technology application and integration.

For a long time, scientific and technological backwardness has been one of the important factors undermining Africa's economic and social development. In 2005, the Africa's Science and Technology Consolidated Plan of Action was passed at the second African Ministerial Conference on Science and Technology held in Dhaka, the capital of Senegal. The plan of action pointed out that ICT and space technology urgently needed to be introduced into Africa's education, healthcare, meteorological service, communication, environmental resource management and other aspects, but the continent was a market almost entirely relying on imports in this sector. In this case, Africa's computer science and ICT should be vigorously developed and local R&D capabilities should be improved. The plan of action builds a brand new platform for Africa's scientific and technological development in the 21<sup>st</sup> century and is of great strategic guidance significance<sup>3</sup>. In 2013, at the call of Rwandan President Paul Kagame and UN ITU Secretary-General Hamadoun Tour, over 1,200 representatives from the African

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1 African Development Bank Database, <https://infrastructureafrica.opendataforafrica.org>

2 van Deursen A.J. A.M., van Dijk, "The digital divide shifts to differences in usage", *New Media & Society*, Vol.16, No.3, 2014

3 Liu Hongwu, Zhang Yonghong, *Africa's Science and Technology Geared to the 21st Century -- A Review on the Africa's Science and Technology Consolidated Plan of Action*; West Asia and Africa, Vol 2, 2006



countries, international organizations, private sectors, the academic circle and other fields gathered at Kigali to attend the first Transform Africa Summit which passed the Smart Africa Manifesto, presented five principles, including putting ICT at the center of social and economic development in African countries, and established the execution framework of the Smart Africa Alliance. The manifesto was endorsed by the African Union in January next year whose supporters extended from the seven signatories to the entire African continent. In 2020, the Digital Transformation Strategy for Africa 2020 - 2030 set up an overall development goal of using digital technology to innovate and transform Africa's society and economy, achieve poverty alleviation, address unemployment and other social problems and promote Africa's social and economic development. The IT-based digital economy will have a positive effect in extensive fields for Africa's social and economic development as it can better promote poverty alleviation, increase employment and support the sustainable transformation of Africa's society and economy<sup>1</sup>.

At present, the digital transformation in Africa's agriculture, finance, consumption and other areas is picking up its speed, and the industrial digitalisation has expanded to more and more economic sectors. As to traditional industries, the number of start-ups in the agritech sector is on the rise across the African continent. By applying integrated digital technology in the traditional agricultural sectors, i.e., achieving digital transformation for the traditional agricultural sectors, the African countries can quickly improve their productivity, enhance small farmers' market connection, strengthen financial inclusion and accelerate agricultural transformation<sup>2</sup>. As to digital finance development, over 500 African companies are providing technological innovations in fintech. According to the report released by the Groupe Speciale Mobile Association (GSMA), there were 1 billion registered mobile payment accounts across the world, and over 400 million of them were in Sub-Saharan Africa, and about 70% of global mobile payment-backed transactions happened and 60% of the turnovers of such transactions were generated in Africa<sup>3</sup>. There are 469 million registered mobile payment accounts in Sub-Saharan Africa and 181 million of them are active accounts with a mobile-payment-backed transaction volume of US\$456 billion<sup>4</sup>. As to digital consumption, the data supervision of the UNCTAD indicates that Africa's online shopping users grew by 18% on average between 2014 and 2017 as one of the global regions experiencing the fastest growth. Now there are many influential e-commerce platforms established in Africa, such as Jumia, Kilimall, Zando, etc. Jumia, dubbed "Africa's Alibaba", was listed on the New York Stock Exchange in April 2019, providing online shopping service for 10 African countries, including Nigeria, Egypt and Morocco.

### **1.1.3 Respond to Challenges with Innovation: The Adaption and Innovation of Africa's Digital Economy in the Post-COVID Era**

The outbreak of COVID-19 pandemic has severely disrupted the world's economic development and led to the mounting economic downturn risks. Africa, the continent with the

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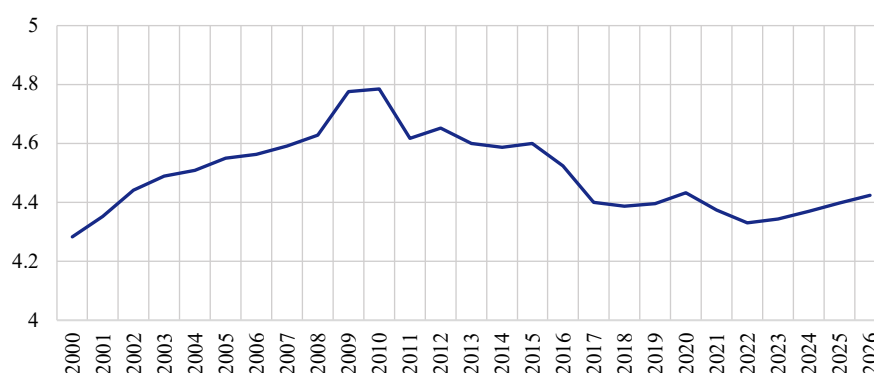
<sup>1</sup> African Union, "The Digital Transformation Strategy for Africa(2020-2030)", <https://au.int/sites/default/files/documents/38507-do-c-dts-english.pdf>

<sup>2</sup> Piao Yingji, The Characteristics, Problems and Strategic Choices in Africa's Industrial Digitalisation, West Asia and Africa, Vol 3, 2022

<sup>3</sup> GSMA, <https://www.gsma.com/#>

<sup>4</sup> Statista database, <https://statista.com>

most developing countries, is experiencing a significant economic recession. According to the IMF data, 41 out of the 54 African countries had evident economic contraction in 2022, and Africa’s share of global GDP dropped to 4.33%, the lowest level since 2002. Africa cannot regain its share of pre-COVID global GDP in the foreseeable future (see Fig 1.1)<sup>1</sup>. The research conducted by the UNCTAD shows that global merchandise trade import-export volume reduced by approximately 7.5% in 2020, but the export and import volume of ICT products rose by 4% and 1.1% respectively, which suggested a great “rising-against-the-tide” resilience of digital transaction under the lockdown caused by the pandemic. However, Africa’s export and import volume of ICT products both took a nosedive<sup>2</sup>. The outbreak of the pandemic exposes some of Africa’s problems, such as single economic structure and high dependence on foreign supply; it also shows Africa’s weakness of failing to seize the opportunity provided by global digital economy development due to its own underdeveloped digital economy.



**Fig 1.1 Africa’s Share of Global GDP (calculated by purchasing power parity)**

Against this background, Africa is actively exploring the approaches to develop its digital economy. On February 8, 2021, Kenyan President Uhuru Kenyatta, when attending the 34<sup>th</sup> Ordinary Session of the Assembly of the Heads of State and Government of the African Union, pointed out that when Kenya’s “lockdown” policy was implemented to respond to the outbreak of the pandemic, the government and enterprises kept running (as usual) thanks to digital technology. 40% of Kenya’s private companies were engaging in e-commerce and 70% of the country’s e-commerce payment was settled through various e-currency payment platforms. He called for the establishment of a single digital economic market in Africa with digital technology<sup>3</sup>. In April 2021, South African President Cyril Ramaphosa published an open letter to all citizens in the country. He said in the letter that the pandemic has accelerated South Africa’s economic transformation, and when pushing for economic recovery and rebuilding during the post-COVID era, digital economy can bring more employment opportunities for the country<sup>4</sup>. In July 2020, at the online meeting under the theme of “How to Use ICT and E-gov to Respond to the COVID-19 Pandemic in an Innovative Way - Africa’s Solution” sponsored

<sup>1</sup> IMF, <https://www.imf.org/en/Publications/WEO/weo-database/2021/October>

<sup>2</sup> UNCTAD, “E-Commerce and the Digital Economy in LDCs: At Breaking Point in COVID-19 Times”, [https://unctad.org/system/files/official-document/dtlstict2022d1\\_en.pdf](https://unctad.org/system/files/official-document/dtlstict2022d1_en.pdf)

<sup>3</sup> Bin Jiancheng, Xu Haoran, Wei Song; The Conditions, Challenges and Strategies to Develop Digital Economy in Africa during the COVID-19 Pandemic; Journal of Jiangsu Normal University Philosophy and Social Sciences Edition, Vol 3, 2022

<sup>4</sup> South African President: Digital Economy Brings More Employment Opportunities for the Country, Guangming Daily, <https://m.gmw.cn/baijia/2021-04/13/1302226816.html>

by United Nations Department of Economic and Social Affairs (UN DESA), Maria-Francesca Spatolisano, Assistant Secretary-General in the UN DESA, stressed that the crisis brought by the pandemic has forced Africa to review its current laws and regulations in order to promote the advancement of communication technology and the development of innovative e-gov ecosystem<sup>1</sup>.

As to industrial development, many countries promote online education, telemedicine, digital payment and other services, and push for the development of e-commerce, logistics and other businesses. For example, speaking of digital healthcare, Africa Centres for Disease Control and Prevention worked with 20 international partners and funds to build a nonprofit African electronic platform, helping the African countries' government purchase diagnostic, test and medical equipment from certified suppliers<sup>2</sup>. Kenya successfully conducted a telemedicine service with the M-PESA mobile payment platform to help patients avoid the risk of cross-infection at a hospital. As to e-commerce and mobile payment, the Nigerian e-commerce platform Jumia enhanced its cooperation with the suppliers to provide faster delivery and better shopping experience when the supply chain was disrupted by the pandemic. According to the 2020 Banking Innovation Survey Report released by the Central Bank of Kenya on May 26, 2021, the country's e-banking development had been accelerated due to the pandemic, which pushed the banking financial institutions to actively conduct digital transformation. According to a survey done on 39 commercial banks and 14 small loan companies in the country, 56% of the interviewees said promoting and using mobile and internet platforms and other channels was one of the development priorities for them during the outbreak of the pandemic in 2020<sup>3</sup>. Moreover, the pandemic has also urged many enterprises and government organizations to speed up their digital transformation for their COVID-19 response. These endeavors have brought new thoughts and opportunities for Africa's digital economy development.

#### **1.1.4 Bridge the Digital Divide and Explore Inclusive Growth for the Digital Economy**

As Africa's digital infrastructure keeps improving and its digital technology undergoes a fast development, Africa's digital economy has new growth opportunities. However, the problems of imbalanced development of Africa's digital economy and the digital divide at different levels are also exposed. First, the gap between Africa's digital infrastructure and digital applications is growing. For example, Sub-Saharan Africa is still the region with the largest disparity between digital service coverage and use rate. Its 3G internet penetration rate rose to 84.6% in 2022, and its 4G internet penetration rate grew to 65% from 27% in 2018, but only 25% of its population can access to mobile phone service and over half of the adults (18 and above) there do not have internet access<sup>4</sup>. Second, the dividend brought by digital economy has yet to be fully released. According to a survey report conducted by the World Bank in 2023, since the beginning of the outbreak of the COVID-19 pandemic, there has been a growing gap in mobile service usage

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<sup>1</sup> Digital Technology Improves Africa's Response to the COVID-19 Pandemic and China Shares These Experiences, Xinhua News Agency App, <https://baijiahao.baidu.com/s?id=1671111055283449928&wfr=spider&for=pc>

<sup>2</sup> OECD(2021), "Africa's Development Dynamics 2021", [https://www.oecd-ilibrary.org/development/africa-s-development-dynamics-2021\\_0a5c9314-en](https://www.oecd-ilibrary.org/development/africa-s-development-dynamics-2021_0a5c9314-en)

<sup>3</sup> Central Bank of Kenya Reports: The COVID-19 Pandemic Accelerates E-Banking Development, Securities Times, <https://baijiahao.baidu.com/s?id=1700956876156764180&wfr=spider&for=pc>

<sup>4</sup> GSMA, "The State of Mobile Internet Connectivity 2023", <https://www.gsma.com/r/somic/>

between Africa's large formal enterprises and small informal businesses, between companies owned by young men and companies owned by older women, and between wealthier, urban and better-educated families and poorer, rural and worse-educated families<sup>1</sup>.

In recent years, Africa has taken proactive measures in the fields of digital economy to vigorously expand the scope of digital economy applications, lower the entry barrier to use digital technology, improve e-governance system and try to achieve inclusive growth and sustainability with digital transformation. For example, the African Union rolls out a series of digital strategies for education, agriculture, healthcare and other key areas. The Digital Education Strategy and Implementation Plan 2023-2028 provides a framework for the adoption of digital technologies aligned with the continent's education strategy; the Digital Agriculture Strategy and Implementation Plan 2023-2027 is designed to support the Member States of the Africa Union to accelerate their agricultural growth and transformation with digital technology; the Digital Health Strategy supports the vision of "high life standard, high-quality life, health and wellbeing" stated in the Agenda 2063 and the objectives in the Africa Health Strategy, i.e., "Healthy Life and Wellbeing for Each African"<sup>2</sup>. In addition, the African Union works with the African Development Bank Group to jointly explore how to achieve inclusive growth and sustainability in the continent. The goal of this joint research is to develop Africa into a prosperous land based on inclusive growth and sustainability from 2023 and 2063 with an annual growth rate between 7% and 10%. The role of digital technology to ensure fast and inclusive economic growth and create employment opportunities in Africa is highlighted<sup>3</sup>. In June 2022, the eighth World Telecommunication Development Conference was held at Kigali during which the Smart Africa Alliance and Digital Cooperation Organization signed a memorandum of understanding on cooperation. According to this MOU, the two organizations would pay attention to the digital empowerment of women, youth and entrepreneurs on the basis of strengthening cross-border data flow<sup>4</sup>.

Throughout the history of Africa's digital economy development, it has generally gone from ICT connectivity to strengthened market-oriented application of digital technology before gradually expanding to an attention given to the digital transformation of the whole society. In the post-COVID era, the African countries realize at a higher level that developing digital economy is an inevitable choice for economic recovery, so they need to put a great effort into building new types of digital infrastructure and innovating the modes of digital economy development. In recent years, the "digital divide" and the development coordination problems in digital economy have already caught the attention of the African countries, and they focus on promoting the inclusive growth and sustainability brought by digital economy. At present, with the construction and development of the digital Silk Road, more and more African countries have reached a consensus with China in digital economy development, which is just like Rahamtalla M. Osman, Permanent Representative of the African Union to China since 2018,

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<sup>1</sup> The world bank, "Digital Africa: Technological Transformation for Jobs", <https://www.worldbank.org/en/region/afr/publication/digital-africa>

<sup>2</sup> African Union, "Powering Africa's Digital Future: AU Ministerial Meeting set to ignite Digital Transformation in Africa", <https://au.int/en/pressreleases/20231121/powering-africas-digital-future-au-ministerial-meeting-set-ignite-digital>

<sup>3</sup> "Digital technologies key to inclusive growth in Africa - African Union Commissioner", African Development Bank Group, <https://www.afdb.org/en/news-and-events/digital-technologies-key-inclusive-growth-africa-african-union-commissioner-60818>

<sup>4</sup> Smart Africa Alliance Signs an MOU with Digital Cooperation Organization to Jointly Promote the Cooperation and Development of Africa's Digital Economy, Ministry of Commerce of the PRC, <http://www.mofcom.gov.cn/article/jmxw/202206/20220603317533.shtml>

said in a video message for the 2021 International Forum on South-South Cooperation and Trade in Services that “south-south cooperation can build a more inclusive and sustainable digital economy<sup>1</sup>”. It can be foreseeable that Africa, with a large market and young population structure, will see its digital economy development reach new heights, and China-Africa cooperation will keep injecting impetus to the continent’s digital economy development.

## **1.2 The Evaluation System for Africa’s Digital Economy Development**

### **1.2.1 A Statement of the Main Concepts**

#### **(1) Digital Economy**

Digital technology, with internet, software and information as the representatives, was booming in the developed countries at the end of the 20<sup>th</sup> century and caught the attention of the western economists first. The digital economy rises in response to the proper time and conditions. The productivity of digital technology was given priority and digital-technology-backed industries and their market-oriented applications were highlighted when defining the digital economy at early stage. As digital technology constantly makes breakthroughs and has extensive application in the economy and society, the definition of the connotation and scope of the digital economy has undergone some new changes, and the focus on the digital economy gradually shifts to how it disrupts production relations and integrates with other social sectors<sup>2</sup>. This is particularly important for the developing countries that are already affected by the digital economy in traditional sectors, such as agriculture, tourism, and transportation<sup>3</sup>.

Currently, there is no consensus on the understanding of the digital economy by the researchers across the world, and the concepts of the digital economy can be roughly divided into an understanding in a narrow sense and one in a broad sense. In a narrow sense, the digital economy is deemed as an industrial economy, and the production, consumption and distribution of digitalized goods and services should be decoupled from the sectors which rely on traditional national economic activities in order to be developed into an independent and core industry of national economy, i.e., the digital industry. However, we believe it is unscientific to evaluate the development of the digital economy in the African countries and other developing countries solely based on the development of the digitalized products and the digital industry. In this case, we fully consider the penetration features of digital technology and the role of data as a critical factor, and define the digital economy as a combination of a series of economic activities, including production, circulation and consumption, conducted with data, the critical production factor, at its core. We believe the digital economy should not only include the digital industry and transaction supported by the development of digital technology, but also cover the digital infrastructure which ensures smooth digital transaction, digital media, digital products, digital services and etc.

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1 Permanent Representative of the African Union to China: Carry out South-South Cooperation and Build a More Inclusive and Sustainable Digital Economy, China.com.cn, [http://cn.chinagate.cn/news/2021-09/17/content\\_77760072.htm](http://cn.chinagate.cn/news/2021-09/17/content_77760072.htm)

2 Chen Xiaohong, Li Yangyang, Song Lijie, Wang Yangjie, The Theoretical System of Digital Economy and Its Research Prospects, Management World, Vol 2, 2022.

3 UNCTD, “Digital Economy Report 2019”, [https://unctad.org/system/files/official-document/der2019\\_en.pdf](https://unctad.org/system/files/official-document/der2019_en.pdf).

## **(2) Digital Finance**

Finance is a collective name for currency circulation, credit activities and their related economic activities. As time goes by, traditional financial services constantly make progress worldwide, but it faces the problem of high cost and low efficiency and it can hardly penetrate the regions with relatively backward economy as it requires brick-and-mortar offices to serve the marginal population<sup>1</sup>. According to the interpretation given by the People's Bank of China, online finance is a new type of financial service mode as traditional financial institutions and internet enterprises use internet technology and ICT to provide accommodation of funds, payment, investment and information brokerage. The maturing of big data, cloud computing and other technologies leads to the fast development of digital financial industry, and fintech drives traditional financial institutions to constantly improve transaction efficiency, safety and transparency, providing more direct and targeted financial services with wider coverage<sup>2</sup>. Fintech companies' investment, financing, mergers and acquisitions, IPOs and other financial activities grow year by year, and digital currency, digital payment and digital banking are borne at the right moment. The products and services of digital finance cover not only the businesses provided by banks and non-bank institutions through digital technology, such as e-currency, mobile financial services, online financial services and direct bank, but also checking personal financial information, statement of account and transaction details via digital devices<sup>3</sup>, which offers convenient and rapid financial operation for the consumers to meet their demands, such as borrowing money.

Generally speaking, digital finance, with information technology development as its prerequisite, is a new financial business form that relies on cloud computing, big data, AI and other digital infrastructures to drive the digital transformation of traditional financial services, which can spawn a large number of fintech applications, including digital currency, digital payment and digital banking. Specifically, digital finance contains three aspects: the support of traditional financial services, the driving of information technology and the innovative applications of fintech. It can overcome the hurdle of traditional financial services that the main resources are deployed in the population-intensive regions and commercial hubs in order to meet the demands of small and micro businesses and low-income people, so it is more inclusive and convenient.

## **(3) Digital Consumption**

The coupling of the digital economy and capital gives birth to digital consumption, innovates consumption forms and modes, breaks the time and space limitations of consumption and renews consumption concepts<sup>4</sup>. By empowering the supply side, the digital economy makes the modes and content of consumption digital and smart with digital and intelligent production. It also inspires consumption potential from the demand side, changes the consumption concepts

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<sup>1</sup> Guo Feng, Wang Jingyi, Wang Fang, Kong Tao, Zhang Xun, Cheng Zhiyun, The Measurement of China's Digital Financial Inclusion Development: Indicators Compilation and Spatial Characteristics, *China Economic Quarterly*, p1401-1418, 2020,19(04).

<sup>2</sup> World Bank, "Digital Financial Services. World Bank, 2020, <https://pubdocs.worldbank.org/en/230281588169110691/Digital-Financial-Services.pdf>

<sup>3</sup> Chen Xitong, Mao Zeqiang, The Risk Characteristics, Supervision Challenges, Targets and Instruments of Digital Financial Products and Services, *Southwest Finance*, p14-26, 2020,(09).

<sup>4</sup> Chen Peng, Long Yue'er, Digital Consumption Alienation: Its Nature and Implications and How to Respond to It, *Consumer Economics*, 2023.

and habits of the residents, and constantly promotes digital consumption to become the new driver of economic development.

The academic circle has yet to reach a consensus on the connotation of digital consumption, which can be roughly divided into three understandings. The first one considers digital consumption as consumption of digital products, which mainly refers to cell phone, communication products and modern digital products that are directly related to the information and communication industry<sup>1</sup>; the second one thinks digital consumption as the consumption of data elements, which mainly refers to the consumption of digital products and services<sup>2</sup>; the third one believes digital consumption is the consumption activities conducted with the support of digital technology, internet and other tools, and it interprets digital consumption as the coupling of digital technology and consumption. We believe that a single type of digital consumption cannot fully measure the development level of Africa's digital consumption. In this case, we give a relatively broad definition for digital consumption, and we consider it as the consumption activities to meet people's information-oriented, smart, personal and diverse consumption demands with internet and information networks as its main vehicle, data resources as its key production factors and the driving force of digital technology innovation as its engine<sup>3</sup>. It includes both the consumption of digital products and the consumption of digital services.

#### **(4) Digital Divide**

The concept of the digital divide was firstly stated in the series report of *Falling Through the Net* published by the National Telecommunications and Information Administration (NTIA) of the US between 1995 and 2000, which caused extensive attention as a basis for decision making. It raised concern from the academic circle and was discussed among them in the early 1990s. This concept is initially considered as a binary division between those who can access computer and internet and those who can't. The disparity between computer and internet access is later called "the first level of the digital divide". As the research moves along, the researchers begin to explore the areas beyond this disparity. They discovered they had given a very narrow initial definition of the digital divide, so they expanded this concept. The cause of the digital divide is widely understood as a combination of many factors, including the availability of related content, the quality of internet access and user's knowledge and skills. This theoretical shift makes the researchers' focus extend to digital skills and the disparity of its usage, which is called "the second level of the digital divide". Some researchers began to pay attention to users having unequal skills and know-how when using internet devices at that time, and they proposed the concept of "digital inequality". Based on this recognition, the scope of the digital divide is further expanded, which not only focuses on technology access and use, but also pays attention to the consequences and results of these activities, and it is clearly pointed out that technology access and use does not necessarily deliver all the possible technical benefits to the users. The research perspective has shifted to the beneficial results of internet use, which is

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1 Yang Ju, Peng Hao, *The Regional Inclusion and the Interpretation from the Perspective of Political Economy of China's Digital Consumption*, *Consumer Economics*, Vol 3, 2022.

2 Zhu Yan, *Drive the Digital Transformation of the Industrial China with Consumption Upgrading*, *National Governance*, Vol 24, 2021.

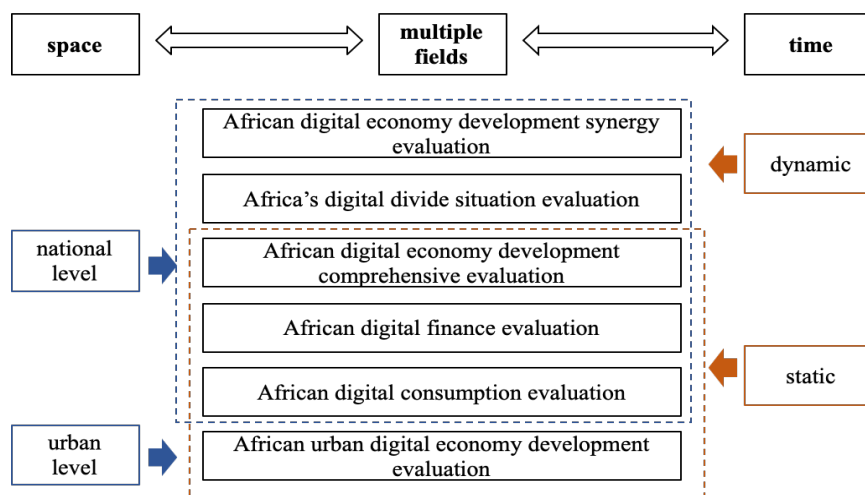
3 Chen Xiaohong, Li Yangyang, Song Lijie, Wang Yangjie, *The Theoretic System of the Digital Economy and Its Research Prospects*, *Management World*, Vol. 2, 2022.

defined as “the third level of the digital divide”. To sum up, the concept of the digital divide has undergone a series of evolutions, including the three dimensions of information and ICT access, use and application results, and it is gradually deemed as a dynamic and multi-dimensional phenomenon caused by a series of factors.

## 1.2.2 Our Thoughts on the Evaluation and the Design of the Evaluation System

### (1) Our Thoughts on the Evaluation

Domestic and foreign-related organizations and institutions have conducted many researches on digital economy development evaluation, but their evaluation results differ a lot due to the difference in their definition of digital economy content. The Digital Economy Report 2019 released by UNCTAD points out that “digital economy is estimated to account for 4.5% - 15.5% of the world’s GDP based on their varied definitions<sup>1</sup>”. Therefore, based on the definition of the broad understanding of the digital economy, the Report argues that the evaluation of the digital economy necessitates the consideration of its systemic and developmental characteristics. Moreover, in order to have a more objective understanding of Africa’s digital divide, this report improves the evaluation system stated in the Africa Digital Economy Development Index and China-Africa Digital Economy Cooperation Report (2023) and includes the quantitative research results of the African countries’ digital divide. And finally, this report complies with the requirement on the operability, flexibility and forward-thinking of the evaluation system. On that basis, it established a multi-layered African digital economy development evaluation system including the analytical layers of space, multiple areas and time (Fig 1.2).



**Fig 1.2 Africa Digital Economy Development Evaluation Framework**

For the analytical layer of “space”, the digital economy development situation of cities reflects the progress in a country’s digital economic field<sup>2</sup>. The role that a city plays evolves from a business and trade hub to an industrial center and a sci-tech innovation powerhouse. The fast urbanization can effectively attract people to cities, produce the population aggregation effect

<sup>1</sup> UNCTAD, “Digital Economy Report 2019”, [https://unctad.org/system/files/official-document/der2019\\_en.pdf](https://unctad.org/system/files/official-document/der2019_en.pdf)

<sup>2</sup> China Academy of Information and Communications Technology, Annual Report on Digital Economy Development of China’s Cities 2021, <http://www.caict.ac.cn/kxyj/qwfb/ztbg/202112/P020211221381181106185.pdf>



and bring out the need for city governance. The central cities (economic and political key cities) are the driver and growth pole of economic development as they gather a great number of businesses, financial institutions, manufacturing companies and service providers and introduce domestic and foreign investment and companies, which demands a more scientific and efficient city governance system. A digital transformation for a city is an “important updating” for its information system, installing a “smart operation system” for the city and promoting the “function-oriented” city life evolving into a “smart” one<sup>1</sup>. Moreover, as the African countries and cities’ governing systems differ from each other to a certain level, an evaluation of Africa’s digital economy development from the perspective of space should separate the country-level situation from the city-level situation.

For the analytical layer of “multiple areas”, an evaluation of Africa’s digital economy should take into account the development situation of many related fields because digital economy is a multi-layered and comprehensive running system. As digital technology keeps penetrating the consumption fields, digital consumption becomes an important area of digital economy development. In the meantime, a solid foundation has been laid to unleash the potential of Africa’s consumption market with Africa’s younger demographic composition, changing payment trends, booming e-commerce and other factors. The digitalized products and services in the consumption area have been gradually integrated into African people’s daily life. Digital consumption is profoundly changing African people’s consumption habits and becoming a new consumption growth driver as an important constituent part of digital economy. Africa’s digital finance is also growing together with its digital consumption. Many African people have no access to convenient, safe and low-cost payment, money transfer, loan and other financial services due to exchange fluctuations and low penetration rate of bank account, and digital finance has become an alternative solution for this problem. At present, digital finance is not only experiencing a fast development in the African countries because of its huge market demand and potential, as well as the innovation of fintech, such as digital payment and e-banking, but also getting ready for a “corner overtaking”. In this case, this report considers Africa’s digital finance and digital consumption as important evaluation areas to support our observation of the characteristics of Africa’s digital economy development.

For the analytical layer of “time”, digital economy has a strong evolution characteristic as the new economic growth paradigm after agricultural economy and industrial economy. It is of great significance to consider the current state and evolution tendency of Africa’s digital economy from the perspective of development for better conducting China-Africa development. In this case, besides a comprehensive evaluation of Africa’s digital economy development situation, Africa’s digital finance and digital consumption situation and city-level Africa’s digital economy development situation from a static viewpoint, this report also constructs a coordinated system development model to evaluate the coordinated evolution of digital economy. Africa’s digital divide is a problem generated by the continent’s digital economy development. This report illustrates the characteristics of Africa’s digital economy development

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<sup>1</sup> Digital Transformation: A New Round of Revolution of Urban Development History, the paper.cn, [https://www.thepaper.cn/newsDetail\\_forward\\_14390133](https://www.thepaper.cn/newsDetail_forward_14390133)

from a dynamic viewpoint in combination with the quantitative researches on different layers of digital divide in the African countries.

## **(2) The Design of the Overall Evaluation System**

This report adopts the synthetic index method to develop its indicators system for digital economy development evaluation. In order to ensure universal coverage for digital economy-related indicators and be consistent with the broad connotation of digital economy to take the generation of digital factors and the process of value realization as logic, this report defines “digital foundation” and “digital application” as the two basic layers in digital economy development, and develops the evaluation system in combination with the development characteristics in the fields of digital economy and the research results of domestic and foreign researchers in this field.

Specifically speaking, as to digital economy comprehensive evaluation, we take reference from the World Bank’s DE4A Diagnostic Tool and Guideline for Task Teams (2020)<sup>1</sup>, the ICT and digital economy statistical indicators system released by Organization for Economic Cooperation and Development (OECD) in 2007 and 2014<sup>2</sup>, the Digital Economy and Society Index (DESI) released by the EU since 2014<sup>3</sup>, the digital economy accounting framework released by G20 in 2018 and 2020<sup>4</sup> and the ICT Development Index (IDI) released by ITU between 2007 and 2019<sup>5</sup>. In order to better analyze the development potential of Africa’s digital economy, we include the dimension of “digital economy innovation” besides “digital economy foundation” and “application of digital economy”.

We take reference from the Financial Development index released by the IMF regularly<sup>6</sup> and the Peking University Digital Financial Inclusion Index of China<sup>7</sup> when evaluating Africa’s digital finance, define “digital finance development level” and “digital infrastructure level” from the layer of “digital foundation” and define “fintech application level” from the layer of “digital application”.

We take reference from the B2C E-commerce Index released by the UNCTAD regularly<sup>8</sup> and the reports related to domestic digital economy fields when evaluating Africa’s digital consumption. The “digital consumption assurance capability” and “digital consumption payment capacity” are used as the evaluation dimensions for “digital foundation”, and the “digital consumption scene carrying capacity” is used as the evaluation dimensions for “digital application”.

For city-level digital economy development, because the synthetic index method cannot be used due to the limited availability of African cities’ data, this report uses the descriptive statistics

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1 The world bank, “Digital Economy for Africa Country Diagnostic Tool and Guidelines for Task Teams”, <https://thedocs.worldbank.org/en/doc/694441594319396632-0090022020/original/DE4ADiagnosticToolV2FINALJUNE24.pdf>

2 OECD, “Measuring the Digital Economy: A New Perspective”, [https://read.oecd-ilibrary.org/science-and-technology/measuring-the-digital-economy\\_9789264221796-en](https://read.oecd-ilibrary.org/science-and-technology/measuring-the-digital-economy_9789264221796-en)

3 EU, <https://digital-strategy.ec.europa.eu/en/policies/desi>

4 G20, “Toolkit for measuring the digital economy”, <http://www.caict.ac.cn/xwdt/ynxw/201903/P020190301528000822496.pdf>

5 ITU, “Measuring the Information Society Report”, <https://www.itu.int/en/ITU-D/Statistics/Pages/IDI/Background.aspx>

6 IMF Financial Development index database, <https://data.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33b>

7 Institute of Digital Finance Peking University, the Peking University Digital Financial Inclusion Index of China (2011-2020), <http://nsd.pku.edu.cn/docs/20221017131046905230.pdf>

8 UNCTAD, “UNCTAD B2C E-COMMERCE INDEX 2019”, [https://unctad.org/system/files/official-document/tn\\_unctad\\_ict4d14\\_en.pdf](https://unctad.org/system/files/official-document/tn_unctad_ict4d14_en.pdf)

method, and takes reference from the Report on Chinese Cities' Digital Economy Development issued by the China Academy of Information and Communications Technology in 2021<sup>1</sup> and World Cities Report 2022: Envisaging the Future of Cities issued by United Nations Human Settlements Programme (UN-Habitat) in 2022<sup>2</sup> to evaluate city-level Africa's digital economy development from three dimensions: network facilities in African cities, network usage preferences and online consumption capacity.

**Table 1-1 An Introduction of Domestic and Foreign Major Reports or Projects Measuring Digital Economy**

<b>Report/Project</b>	<b>Brief Introduction</b>	<b>Issuer and Issuing Time</b>
Toolkit for measuring the digital economy	Evaluate and compare digital economy of various countries from four dimensions: infrastructure, empowering society, innovation and technology application, employment and growth	G20,2018
Roadmap Towards a Common Framework for Measuring the Digital Economy	Propose the layered definition of digital economy and further improve the indicator system to evaluate digital economy, including four level-one indicators, employment, skill, growth, infrastructure, empowering society, innovation and technology application.	G20,2020
Measuring the Digital Economy A New Perspective	Evaluate digital economy from investing in smart infrastructure, empowering society, innovation capacity and ICT promoting economic growth and employment, use the comparison method and develop a digital economy indicators system covering 38 indicators with international comparability	OECD,2014
Measuring the Information Society Report	The report divides the evolution of information society into three stages: network infrastructure and ICT acquisition, the usage of ICT in society, efficient use of ICT and benefiting from it; on the basis of these three stages, the report develops three level-one indicators: ICT introduction, ICT application and ICT capability, and 11 level-two indicators.	ITU,2019
The Digital Economy Initiative for Africa (DE4A)	The project provides a comprehensive framework to evaluate the development environment and level of digital economy in the African countries, and develops an evaluation system from five level-one indicators: digital infrastructure, digital platform, digital financial service, digital entrepreneurship and digital capacity.	The World Bank,2020
The Digital Economy and Society Index (DESI)	The index is used to represent the progress made by digital economy of EU members; it is calculated based on 31 level-two indicators of five major areas in EU members: wind-band network access, human capital, internet application, digital technology application and digital public service.	EU,2022
Financial Development Index	Nine indicators are created from the complex multi-dimensional nature of financial development; the performance of financial institutions and financial markets in depth, coverage and efficiency is summarized, and they are compiled into the overall index of financial development.	IMF,2020
Peking University Digital Financial Inclusion Index	Based on the characteristics of digital financial inclusion, a digital financial inclusion indicators system is developed from three dimensions: digital finance coverage breadth, digital	Research Team, Institute of Digital

<sup>1</sup> China Academy of Information and Communications Technology, Report on Chinese Cities' Digital Economy Development 2021, <http://www.caict.ac.cn/kxyj/qwfb/ztbg/202112/P020211221381181106185.pdf>

<sup>2</sup> UN-Habitat, " World Cities Report 2022: Envisaging the Future of Cities"

	finance usage depth and digitalisation level of financial inclusion; a comprehensive illustration of banking, payment, investment, insurance, money fund, credit service and other business forms is conducted.	Finance, Peking University, 2021
UNCTAD B2C E-COMMERCE INDEX	Four areas, the share of financial accounts, the share of internet users, post reliability index and the number of servers for safe internet, are used as the basic conditions to measure the economies to develop online shopping.	UNCTAD,2019
World Cities Report 2022: Envisaging the Future of Cities	It is designed to envisage the future of cities more clearly based on current trends, challenges and opportunities, including the valuable lessons learned from the COVID-19 pandemic; some suggestions are also given for cities to better respond to all kinds of challenges and find ways to transit to sustainable cities.	UN-Habitat,2022
Report on Chinese Cities' Digital Economy Development	The report develops a digital economy competitiveness index, and reflects the potential of urban digital economy development from six dimensions: digital innovation factors, digital foundation devices, core digital industries, digital integrated application, digital economy demands and digital policy environment. On the basis of collecting, measuring and calculating related data, a quantitative analysis is conducted on the digital economy competitiveness of 52 key cities in China.	China Academy of Information and Communications Technology, 2021

### 1.2.3 Africa's Digital Economy Comprehensive Evaluation Indicators System

#### (1) Digital Economy Foundation

Digital infrastructure construction is the premise of developing the digital economy and a key area for the African countries to give priority to presently. The connotation of digital infrastructure includes three layers: network communication layer, perception storage layer and application integration layer<sup>1</sup>. During the early state of digital economy development, ICT network construction is usually given the priority when building digital infrastructure and promoting the digitalisation process; as the digital industries keep making progress, the development of 5G, integrated circuit and AI gets better, and their supporting infrastructure is also improved. The African countries are still at the early stage of digital economy development, so the indicators selected by this report are also used to evaluate the development level of their ICT network. Following the reliability, accessibility and affordability championed by The Digital Transformation Strategy for Africa(2020-2030)<sup>2</sup>, this report selects infrastructure, network coverage and network performance as the second-level indicators to evaluate Africa's digital economy foundation development situation, and chooses the number of servers for safe internet, the power supply coverage, logistic reliability score and other factors as the basis for the evaluation, among which mobile network charge and fixed network charge are negative indicators, and the rest indicators are positive ones.

#### (2) Digital Economy Application

Digital applications drive Africa's digital economy development. Considering the penetration nature of digital technologies and their integration with every economic and social dimension, this section consists of three second-level indicators: social application, market-oriented

<sup>1</sup> Zhang Yue, A Contrastive Analysis of China and Singapore's Trade in Services and the Revelations, Business & Economy, Vol. 1, 2022

<sup>2</sup> African Union, "The Digital Transformation Strategy for Africa(2020-2030)", <https://au.int/sites/default/files/documents/38507-d0-c-dts-english.pdf>

application and individual application. Eight measuring indicators for it are confirmed, including IPv4/24s ownership, e-government index and the share of ICT service export, and all of them are positive indicators.

### (3) Digital Economy Innovation

Digital innovation is a process where the new combination of digital and physical components of product and service generates new products or provides new services. During the process of digital innovation, on one hand, the generated new products or provided new services can “help promote” the iteration of digital technology, but, on another hand, they are also constantly driven by digital technology. In this case, new combinations of these digital and physical components are generated continuously when producing these products and providing these services<sup>1</sup>, which inspires development potentials for digital economy. As digital economy industries differ a lot from traditional economic industries, the application of high-tech digital technologies, such as big data, AI and cloud computing, requires an enabled innovation and entrepreneurship environment established at a national level, and a large number of outstanding creative talents to provide guidance and blaze the trail. Considering most African countries have a relatively low digital innovation development degree, this section is consisted of two second-level indicators: innovation capability and innovation environment. Eight measuring indicators for it are confirmed, including papers published in sci-tech journals, the share of high-tech product export and global innovation index, among which the share of the service charge of setting up a startup is a negative indicator.

**Table 1-2 Africa’s Digital Economy Comprehensive Evaluation Indicators System**

First-level indicator	Second-level indicator	Evaluation indicator	Unit	P/N	Data source
Digital foundation	Infrastructure	the number of servers for safe internet	Pcs/1 million people	positive	WB
		Power supply coverage	%	positive	WB
		Logistic reliability score	Level	positive	UPU
	Network coverage	3G network coverage	%	positive	GSMA
		Mobile communication penetration rate	%	positive	GSMA
	Network performance	Internet connection speed	Kbit/s	positive	ITU
		Mobile data cost	USD	negative	ITU
		Broadband deals	USD	negative	ITU
	Digital application	Social application	IPv4 /24s ownership	Pcs/100 people	positive
E-government index			Level	positive	UN

<sup>1</sup> Yu Jiang, Meng Qingshi, et al.; Digital Innovation: Finding New Perspectives for Innovation Research and Its Revelations; Studies in Science of Science, Vol 7, 2017.

	Market-oriented application	Share of ICT service export	%	positive	WB	
		Share of ICT goods export	%	positive	WB	
	Individual application	Internet subscription	Subscribers/100 people	positive	WB	
		Data plan subscription	Subscribers/100 people	positive	WB	
		Social media application ratio	%	positive	IP Geolocation	
		Digital-account-based application ratio	Applications/1,000 adults	positive	IMF	
	Digital innovation	Innovation capability	Papers published in sci-tech journals	Million papers	positive	WB
			Share of high-tech product export	%	positive	WB
Global innovation index			Level	positive	WIPO	
Innovation environment		College admission rate	%	positive	WB	
		Working population participation rate	%	positive	ILO	
		Share of education spending	%	positive	WB	
		Amount of assistance for international technical cooperation	USD	positive	WB	
		Share of the cost of setting up a startup	%	negative	WB	

## 1.2.4 Africa's Digital Finance Evaluation Indicators System

### (1) Degree of Financial Development

The size of financial deals keeps growing because of financial development, financial efficiency also keeps improving as financial-service-guided economic development constantly makes progress, and the degree of financial development is designed to measure the foundation of the birth of digital finance. The size of financial system indicates the capability of financial system to pool and integrate financial resources and the scope of financial services provided by financial system, which should be considered comprehensively based on all the constituent parts of financial system; from the perspective of economics, efficiency reflects the relationship between input and output, and the efficiency of a financial system means the proportion of financial input factors to financial/national economy output, so a higher financial system efficiency comes from pooling and distributing financial funds to serve real economy with a lower cost; financial stability refers to the sustainability of pooling financial funds. In this section, the size, efficiency and stability of financial system are selected as the second-level indicators to evaluate the degree of financial development in Africa, and the evaluation bases include private credit from deposit banks and other financial institutions as a share of GDP, stock market capitalization as a share of GDP, bank operating expenses as a share of its total assets and bank Z-score, among which bank operating expenses as a share of its total assets, bank non-performing loan ratio and stock price volatility are negative indicators and the rest are positive indicators.

## (2) Digital Infrastructure Level

Digital infrastructure level is designed to measure the driving force transforming traditional financial services into the new business forms of digital finance. In this section, digital service facility coverage and accessibility are selected as the second-level indicators, and the evaluation bases include 3G network coverage, mobile communication penetration rate, internet connection speed and mobile data cost, among which mobile data cost and broadband deals are negative indicators and the rest are positive indicators.

## (3) Fintech Application Development Level

Fintech application development level is designed to measure how well sci-tech means are applied in financial innovation. Financial Stability Board (FSB) defines fintech as promoting financial innovation with technological means in order to create business models, technological applications and innovative products that have a revolutionary impact on financial market, financial service and financial institutions<sup>1</sup>. Fintech application development level is measured by fintech application coverage and the degree of penetration of mobile fintech application. The evaluation bases include digital-account-based application rate, penetration rate of financial software installation and power-on times per person of financial software, and they are all positive indicators.

**Table 1-3 Africa's Digital Finance Development Evaluation Indicators System**

First-level indicators	Second-level indicators	Evaluation indicators	Unit	P/N	Data source
Degree of financial development	Size of financial system	private credit as a share of GDP	%	Positive	WB
		Deposit bank assets as a share of GDP	%	Positive	WB
		Central bank assets as a share of GDP	%	Positive	WB
		Stock market capitalization as a share of GDP	%	Positive	WB
	Financial system efficiency	Foreign exchange control intensity	Level	Negative	Outbound Investment and Cooperation Instructions by Country (Region)
		Banking industry return on assets	%	Positive	WB
		Bank non-interest income as a share of total income	%	Positive	WB
		Bank operating expenses as a share of total assets	%	Negative	WB
	Financial system stability	Current liabilities as a share of GDP	%	Negative	WB
		Proportion of current assets to deposits and short-term funds (%)	%	Positive	WB

<sup>1</sup> FSB, "(2019).FinTech and market structure in financial services: Market developments and potential financial stability implications", <https://www.fsb.org/wp-content/uploads/P140219.pdf>.

		External debt stock as a percentage of GNI	%	Negative	WB
		Bank Z-score	Level	Negative	WB
Digital infrastructure level	Digital service facility coverage	3G network coverage	%	Positive	GSMA
		Mobile communication penetration rate	%	Positive	GSMA
	Digital service facility accessibility	Internet connection speed	Mbit/s	Positive	ITU
		Mobile data cost	USD	Negative	ITU
		Broadband deals	USD	Negative	ITU
Fintech application development level	Fintech application coverage	Digital-account-based application rate	%	Positive	IMF
		Target group index of financial apps	%	Positive	DataSparkle
		Penetration rate of financial software installation	%	Positive	DataSparkle
	Degree of penetration of mobile fintech application	Usage time per person of financial software	minutes	Positive	DataSparkle
		Power-on times per person of financial software	Power-on times/person	Positive	DataSparkle

## 1.2.5 Africa's Digital Consumption Evaluation Indicators System

### (1) Digital Consumption Support Capacity

Digital consumption support capacity is the prerequisite and guarantee of digital consumption development, which can be interpreted as the capacity of driving consumption development under a certain economic and cultural environment with the popularization and application of internet in the society and its various fields by using basic digital resources and supported by ICT. In this case, digital infrastructure, network coverage, network performance and network application are selected by the researchers as the second-level indicators to measure digital consumption support capacity, and power supply coverage, mobile communication penetration rate and broadband subscription are used as the third-level indicators, among which mobile data cost and broadband deals are negative indicators.

### (2) Digital Consumption Payment Capacity

Digital consumption payment capacity is the economic foundation to support digital consumption development as it includes the payment capacity in the economic environment of the African countries and their potential payment capacity in the future. This research measures the digital consumption payment capacity of the African countries from three dimensions: consumption environment, consumption potential and consumption group portrait, which specifically includes the GDP, per capita income and consumption level of these countries, their share of residents with a digital account, social support rate and etc. The inflation rate and social support rate are negative indicators, and the social support rate refers to non-working age population as a percentage of working age population.



### (3) Digital Consumption Scene Carrying Capacity

Digital consumption scene carrying capacity refers to the application scenarios of digital consumption, i.e., digital consumption business forms. Based on the mobile app statistics for active users released by DataSparkle data platform, we choose the business forms with relatively high activity level in the statistics for our analysis, which cover food, clothing, housing, transportation and other aspects of our daily life, and specifically speaking, they include seven aspects: digital shopping, food and beverages, travel and transportation, mobile game, digital education, online sports and social media.

**Table 1-4 Africa's Digital Consumption Development Evaluation Indicators System**

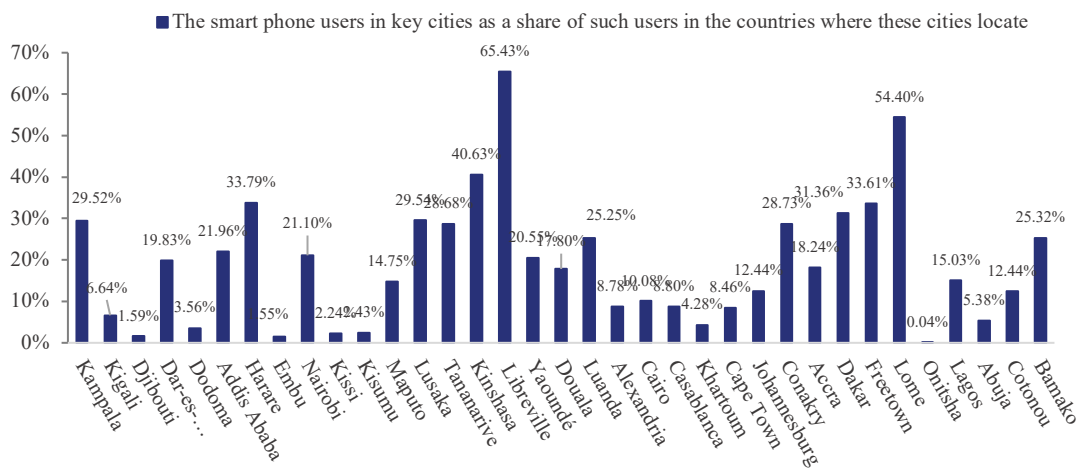
First-level indicators	Second-level indicators	Third-level indicators	Unit	P/N	Data source
Digital consumption support capacity	Infrastructure	Power supply coverage	%	Positive	WB
		Logistics reliability score	Level	Positive	UPU
		The number of servers for safe internet	Servers/million people	Positive	WB
	Network coverage	3G network coverage	%	Positive	GSMA
		Mobile communication penetration rate	%	Positive	GSMA
	Network performance	Internet connection speed	Kbit/s	Positive	ITU
		Mobile data cost	USD	Negative	ITU
		Broadband deals	USD	Negative	ITU
	Network application	Internet subscription	Subscribers/hundred people	Positive	WB
		Data plan subscription	Subscribers/hundred people	Positive	WB
Digital consumption payment capacity	Consumption environment	GDP	hundred million dollars	Positive	WB
		Per capita GDP	USD	Positive	WB
		Net national income per capita	USD	Positive	WB
		Household final consumption expenditure	hundred million dollars	Positive	WB
		Per capita final consumption expenditure	USD	Positive	WB
		Inflation rate	%	Negative	WB
		Urbanization level	%	Positive	WB
	Consumption potential	Proportion of Internet users	%	Positive	DataSparkle
		Proportion of digital account users	%	Positive	IMF
		Smart phone users	Persons	Positive	DataSparkle
Consumption group portrait	Proportion of population aged 15-64	%	Positive	WB	

		Social support rate	%	Negative	WB
		College admission rate	%	Positive	WB
Digital consumption scene carrying capacity	Digital shopping	App installation penetration rate	%	Positive	DataSparkle
		Post-installation target group index	%	Positive	DataSparkle
		Average usage time per person	Minutes/year	Positive	DataSparkle
		Power-on times per person	Power-on times/year	Positive	DataSparkle
	Food and beverages	App installation penetration rate	%	Positive	DataSparkle
		Post-installation target group index	%	Positive	DataSparkle
		Average usage time per person	Minutes/year	Positive	DataSparkle
		Power-on times per person	Power-on times/year	Positive	DataSparkle
	Travel and transportation	App installation penetration rate	%	Positive	DataSparkle
		Post-installation target group index	%	Positive	DataSparkle
		Average usage time per person	Minutes/year	Positive	DataSparkle
		Power-on times per person	Power-on times/year	Positive	DataSparkle
	Mobile game	App installation penetration rate	%	Positive	DataSparkle
		Post-installation target group index	%	Positive	DataSparkle
		Average usage time per person	Minutes/year	Positive	DataSparkle
		Power-on times per person	Power-on times/year	Positive	DataSparkle
	Digital education	App installation penetration rate	%	Positive	DataSparkle
		Post-installation target group index	%	Positive	DataSparkle
		Average usage time per person	Minutes/year	Positive	DataSparkle
		Power-on times per person	Power-on times/year	Positive	DataSparkle
Social media	App installation penetration rate	%	Positive	DataSparkle	
	Post-installation target group index	%	Positive	DataSparkle	

		Average usage time per person	Minutes/year	Positive	DataSparkle
		Power-on times per person	Power-on times/year	Positive	DataSparkle

### 1.2.6 City-level Africa’s Digital Economy Development Evaluation System

As currently Africa’s digital economy development is concentrated in certain key cities, the digital divide can be addressed and an important radiation effect can be produced from the key cities to their surrounding urban circles by developing reliable and affordable mobile and digital consumption and in the key cities and coordinating the available digital measures at the national and regional level. In this case, we select some key African countries’ capital and cities with special status for this analysis, and the smart phone users in these cities as a share of such users in the countries where these cities are located are shown in Figure 1.3. The proportion exceeds 10% for most of these cities, among which there are six cities, Libreville, Lome, Kinshasa, Harare, Freetown and Dakar, having a share exceeding 30%. The figure for Libreville and Lome even goes beyond 50%.



**Fig 1.3 The Smart Phone Users in Key Cities as a Share of Such Users in the Countries Where These Cities Locate**

As to the evaluation indicators, in order to understand the Internet preferences and online consumption capacity of the residents in the key African cities and the distribution of mobile data of current Africa’s digital economy market, and considering the fact that the continent is at the state of building the momentum of digital consumption, we select the related data of six types of app, including communication, social networking, shopping, education, travel and local tourism and news magazine. We also select the target group index and average usage time per person which represent app market share and potential user ratio, smart phone ownership, per capita WIFI traffic consumption and per capita mobile data consumption which reflect Africa’s consumer’s consumption capacity, and 4G and 3G network usage which reflects the distribution of mobile data of mobile economy market in the Africa’s key cities.

## 1.3 The Method for Measuring the Development Level of Africa’s Digital Economy

### 1.3.1 Descriptions of the Samples and Data

According to the data released by the UN, there are 54 Member States in Africa. China has established diplomatic ties with 53 of them till June 30, 2022, except for Eswatini in Southern Africa<sup>1</sup>. These 53 countries are also the participants of the Eighth Ministerial Conference of the Forum on China-Africa Cooperation in 2021. In this case, we collect and sort out the related data of these 53 countries. The macro data are provided by the UN, World Bank, ITU, IMF and other authoritative reports and organizations, and the data related to regional development in Africa are provided by African Development Bank, African Network Information Centre and other institutions. Moreover, city-level Africa’s digital economy development data and the data related to Africa’s mobile apps are provided by DataSparkle data platform. However, as we could only get very limited data from certain African countries, we ultimately selected the sample data from 32 African countries during 2014 and 2023 for Africa’s digital economy development comprehensive evaluation, Africa’s digital economy development coordination evaluation and Africa’s digital divide evaluation; we select the sample data from 31 African countries in recent years for Africa’s digital consumption index; we select the sample data from 35 cities in 26 African countries in 2023 to write the Report on the Development of Africa’s City-level Digital Economy.

**Table 1-5 Table of the Distribution of the Sample Data Used in the Report<sup>2</sup>**

Evaluation details	Eastern Africa	Western Africa	Southern Africa	Northern Africa	Central Africa
Africa’s digital economy development comprehensive evaluation, Africa’s digital economy development coordination evaluation and Africa’s digital divide evaluation	Ethiopia, Kenya, Rwanda, Tanzania, Uganda, Burundi	Benin, Burkina Faso, Cote d'Ivoire, Ghana, Guinea, Mali, Niger, Nigeria, Senegal, Togo	Botswana, Eswatini, Lesotho, Namibia, South Africa, Zimbabwe, Zambia, Malawi, Mozambique, Madagascar	Algeria, Egypt, Morocco, Tunisia	Angola, Cameroon
Africa’s digital finance development evaluation	Ethiopia, Kenya, Rwanda, Tanzania, Uganda,	Benin, Burkina Faso, Cote d'Ivoire, Ghana, Mali, Nigeria,	Botswana, Lesotho, South Africa, Eswatini, Madagascar, Zambia,	Algeria, Egypt, Morocco, Tunisia	Angola, Cameroon

<sup>1</sup> The official website of the Ministry of Foreign Affairs of the PRC, [https://www.mfa.gov.cn/web/ziliao\\_674904/2193\\_674977/200812/t20081221\\_9284708.shtml](https://www.mfa.gov.cn/web/ziliao_674904/2193_674977/200812/t20081221_9284708.shtml)

<sup>2</sup> We take reference from the division of the member states in various African communities, <https://au.int/en/organs/recs> and the geographic area division of countries provided by United Nations Statistical Office, <https://unstats.un.org/unsd/methodology/m49/overview/>

		Senegal, Niger, Senegal, Togo	Mozambique, Zimbabwe, Malawi		
Africa's digital consumption development evaluation	Uganda, Rwanda, Tanzania, Ethiopia, Kenya, Burundi	Guinea, Ghana, Senegal, Togo, Nigeria, Niger, Gambia	South Africa, Botswana, Namibia, Lesotho, Madagascar, Zimbabwe, Mozambique, Zambia	Algeria, Egypt, Morocco, Tunisia, Sudan	Angola, Chad, Congo, Gabon, Cameroon
City-level Africa's digital economy development evaluation	Kampala, Djibouti, Dar es Salaam, Dodoma, Addis Ababa, Embu, Nairobi, Kissi, Kisumu	Conakry, Accra, Dakar, Freetown, Lome, Onitsha, Lagos, Abuja, Cotonou, Bamako	Johannesburg, Cape Town, Harare, Maputo, Lusaka, Antananarivo	Alexandria, Cairo, Casablanca, Khartoum	Kigali, Kinshasa, Libreville, Yaounde, Douala, Luanda

### 1.3.2 The Method to Evaluate the Development of Digital Economy

#### (1) Regularization Approach

As the indicators are used to measure different layers of data, their value's dimension and order of magnitude have a significant difference. In this case, these indicators can only be compared with each other and used to ensure the accuracy of the estimated final index after being normalized.

During their normalization, the implications of indicator size on the whole system must be distinguished. If the bigger a single economic indicator value is, the better it is for the development of the economic system, then the positive indicator calculation method shall be applied:

$$x_{ik}^{t'} = \frac{x_{ik}^t - \min\{x_k\}}{\max\{x_k\} - \min\{x_k\}}$$

However, if the smaller a single economic indicator value is, the better it is for the development of the economic system, then the negative indicator calculation method shall be applied, which is:

$$x_{ik}^{t'} = \frac{\max\{x_k\} - x_{ik}^t}{\max\{x_k\} - \min\{x_k\}}$$

In the equation above,  $i = 1, 2, \dots, g$  represent the African countries,  $k = 1, 2, \dots, n$  represent the indicators,  $t = 1, 2, \dots, m$  represent the years, and  $\max\{x_k\}$  and  $\min\{x_k\}$  refers to the biggest and smallest value of the indicators in these years respectively. When the indicators are normalized, some of the results might be 0. In this case, the normalized data will be shifted, and the equation of  $X_{ik}^t = x_{ik}^{t'} + 0.0001$  applies. The  $X_{ik}^t$  is the value of the normalized indicator.

#### (2) How to Decide the Weight

We adopt the objective weighting method, and entropy weight method, to decide the indicator weight. The size of the information provided by the entropy of each indicator is used by the

entropy weight method to decide each indicator's weight. The bigger the data information is, the lower the uncertainty is and the the smaller the dispersion degree is and the bigger the weight of the corresponding indicator is. The interference of human factors in deciding the weight of the evaluation indicators can be prevented, and the evaluation result can be more objective and geared to practical situations when using the entropy weight method to give weight to the indicators.

First of all, we need to calculate the weight of indicator  $k$  in year  $t$  of each country, and we use  $w_{ik}^t$  to represent it,

$$w_{ik}^t = \frac{x_{ik}^t}{\sum_{t=1}^m \sum_{i=1}^g x_{ik}^t}.$$

We define the information entropy of indicator  $k$  as  $E_k$

$$E_k = -\frac{1}{\ln(m \times g)} \sum_{t=1}^m \sum_{i=1}^g w_{ik}^t \times \ln w_{ik}^t.$$

The redundancy rate of the information entropy should be calculated as this:  $d_k = 1 - E_k$ . And based on the redundancy rate of the information entropy, the weight of indicator  $k$  can be calculated as below:

$$W_k = \frac{d_k}{\sum_{k=1}^m d_k}$$

### (3) Comprehensive Evaluation Model

After getting the weight of each indicator in the overall score, the score of each indicator in year  $t$  can be calculated by multiplying its weight  $W_k$  and the normalized value of indicator  $k$ , and the score of indicator  $k$  of country  $i$  in year  $t$  is as follows:

$$S_{ik}^t = W_k \times X_{ik}^t$$

After getting the score of each indicator of each country in each year, the overall score of each country in a single year can be calculated by summing. Let's say  $T_i^t$  is the evaluation score of the digital economy development indicators of the  $i$ th country under evaluation in year  $t$ , the final score based on the linear weighting comprehensive evaluation formula would be:

$$T_i^t = \sum_{k=1}^n S_{ik}^t$$

## 1.3.3 The Evaluation Method for Digital Economy Development Coordination

### (1) Measure and Calculate the Degree of Order of the Indicators

According to the definition of digital economy, we conduct a dynamic evaluation for the evolution of Africa's digital economy system based on the coordination theory. First, we define the digital economy system as  $S = \{S_1, S_2, S_3\}$ , among which  $S_1$  is the digital foundation sub-system,  $S_2$  is the digital application sub-system, and  $S_3$  is the digital innovation sub-system.

Each of these sub-system is consisted of various basic factors. The coordination degree of systems refers to the degree of harmonious co-existing among inter-system and intra-system factors during the development, and it reflects the tendency of the systems are move from disordered state to ordered. The variables which play a decisive role in the evolution of the system are named order parameters and represented by  $R_{jk}$ , and  $j$  reflects the three sub-systems forming digital economy;  $k = 1, 2, \dots, n$  reflect the order parameters of a certain sub-system, the value of the order parameters is:  $R_{jk} = (r_{jk}^1, r_{jk}^2, \dots, r_{jk}^t)$ , and  $t$  represents time.

Let's say  $\beta_{jk}$  and  $\alpha_{jk}$  reflect the lower and upper bound of the value of parameter  $R_{jk}$  respectively. If  $R_{jk}$  is a positive indicator, the bigger the value of the indicator is, the greater the degree of order of the system is; if  $R_{jk}$  is a negative indicator, the bigger the value of the indicator is, the smaller the order degree of the system is. Using the concepts of subordinate degree of fuzzy mathematics, we get the degree of order of each component  $r_{jk}^t$  of certain order parameter  $R_{jk}$  in the sub-system  $S_j$  with the following equation.

$$u_{jk}^t(r_{jk}^t) = \begin{cases} \frac{r_{jk}^t - \beta_{jk}}{\alpha_{jk} - \beta_{jk}} & (R_{jk} \text{ is positive indicator}) \\ \frac{\alpha_{jk} - r_{jk}^t}{\alpha_{jk} - \beta_{jk}} & (R_{jk} \text{ is negative indicator}) \end{cases}$$

### (2) Measure and Calculate the Degree of Order of the System

In general, the contribution of the sub-system  $S_j$  to the system  $S$  at time  $t$  can be calculated by  $u_{jk}^t(r_{jk}^t)$ , i.e., the degree of order of the sub-system, which can be represented by  $U_j^t$ . We use the geometric mean method for its calculation, and the formula is as follows:

$$U_j^t = \sqrt[n]{\prod_{k=1}^n u_{jk}^t(r_{jk}^t)} \quad , k = 1, 2, \dots, n$$

### (3) Measure and Calculate the Coordination of the System

We construct a system coordination model of two-period changes, and we believe the changes of the ordered state of each sub-system on the time dimension decide the coordination of the compound system. Let's say at the time  $t_0$ , the degree of order of sub-system  $S_j$  is  $U_j^0$ , and when the compound system evolves to time  $t_1$ , the degree of order of sub-system  $S_j$  is  $U_j^1$ , so the coordination degree of the compound system at time  $t_1$  would be:

$$C = \theta \sqrt[3]{\left| \prod_{j=1}^3 (U_j^1 - U_j^0) \right|}$$

In the equation above  $\theta = \min[U_j^1 - U_j^0] / |\min[U_j^1 - U_j^0]|$ . In this case, we know  $C \in [-1, 1]$ . The bigger its value is, the higher the coordination of the compound system is, otherwise the coordination would be lower. The necessary and sufficient condition for coordination  $C$  to be positive is that the degree of order of the three sub-systems at time  $t_1$  is greater than the value at time  $t_0$ , which means the compound system is at the state of coordinated evolving. For the degree of order of the three sub-systems at time  $t_1$ , if at least one of them is smaller than the

value at time  $t_0$ , it will make coordination  $C$  negative, which means the compound system is at the state of non-coordinated evolution. Moreover, if the increase of the degree of order of one sub-system is dramatic and at least the increase of the degree of order of one of the other two sub-systems is modest, it means the coordinated development degree of the compound system is at a low level despite the fact the coordination of the compound system is positive with a very small value. We ultimately divide system coordination into six coordination levels according to the measured and calculated value of the coordination (see Table 1-6).

**Table 1-6 Division of System Coordination Level**

Coordination	Coordination level	Coordination	Coordination level
$c \in [-1, -0.666)$	Highly non-synergistic	$c \in [0, 0.333)$	Mildly synergistic
$c \in [-0.666, -0.333)$	Moderately non-synergistic	$c \in [0.333, 0.666)$	Moderately synergistic
$c \in [-0.333, 0)$	Mildly non-synergistic	$c \in [0.666, 1]$	Highly synergistic

### 1.3.4 The Measuring and Calculating Method of Digital Divide

We take reference from the research result of Brookings Institution and the Development Policy Research Unit, University of Cape Town (DPRU) <sup>1</sup> and measure and calculate the comprehensive digital development divide, digital foundation divide, digital application divide and digital innovation divide of Africa and the African countries. The specific methods are as follows:

First, we take the world's average level as the critical value to decide the degree of Africa's digital divide. We calculate the difference between the positive indicators of Africa's digital economy development and the world average with the equation:  $digd_i^t = (x_{world}^t - x_i^t) / x_{world}^t$ . We calculate the difference between the negative indicators of Africa's digital economy development and the world average with the equation:  $digd_i^t = (x_i^t - x_{world}^t) / x_{world}^t$ . If the calculated  $digd_i^t$  is a negative value, country  $i$  is deemed as "non-vulnerable" on this indicator. The proportion of "vulnerable" countries in the sample is calculated by the equation:  $VI_{Africa}^t = q/i$ , which can be used to evaluate the digital divide of the African countries in each year in a broad sense, and  $q$  in the equation means the number of vulnerable countries and  $i$  means the number of sample countries. After further measuring and calculating the occurrence depth of Africa's digital divide, we can deduce the gap matrix between the digital economic development of the African countries and the world average with the following formula:

$$k\_digd = \begin{cases} digd_i^t, & \text{if } digd_i^t > 0 \\ 0, & \text{if } digd_i^t < 0 \end{cases}$$

After that we calculate the average value of the overall difference, foundation difference, application difference and innovation difference of the digital economy of the African countries respectively, shown below:

$$VI_i^t = average(k\_digd)$$

<sup>1</sup> AGI&DPRU, "Digitalization and digital skills gaps in Africa: An empirical profile", <https://commerce.uct.ac.za/dpru/articles/2023-09-12-digitalization-and-digital-skills-gaps-africa-empirical-profile>



And we use the value  $\varphi = VI_i^t/q$  to correct  $VI_{Africa}^t$  and get the digital divide index of each of the African countries in different years, i.e.,  $M_i^t = \varphi * VI_{Africa}^t$ .

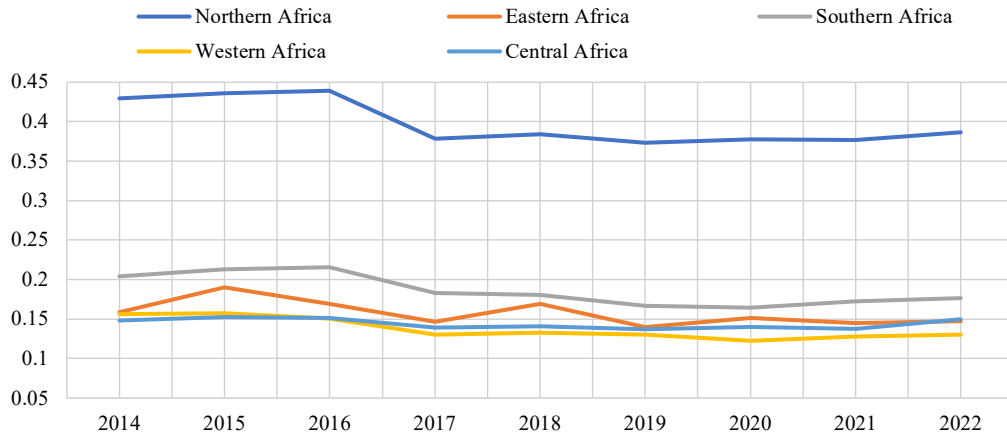
## **1.4 The Evaluation Results of Africa's Digital Economy Development**

### **Level**

#### **1.4.1 The Characteristics of Africa's Digital Economy Comprehensive Development**

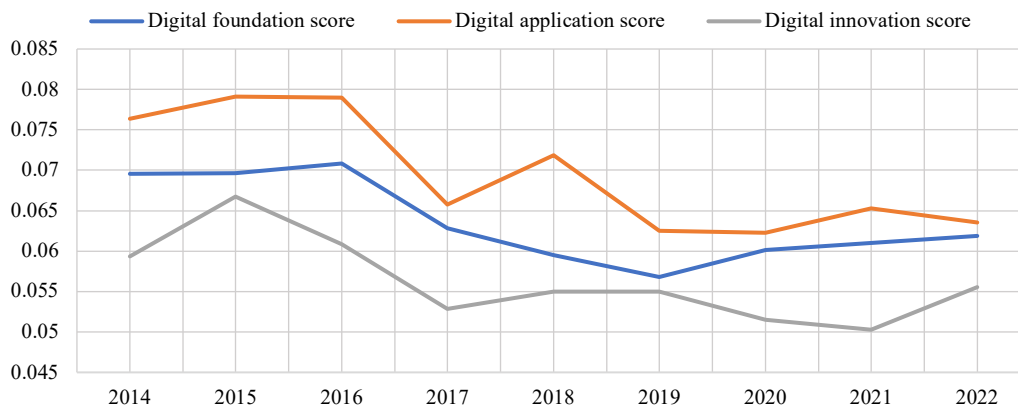
##### **(1) There is a Huge Potential for Africa's Overall Development, But Significant Differences in Development Exist Among the Regions**

Generally speaking, a large difference in digital economy development level can be found among the African regions (Fig 1.4). Specifically, the countries in northern Africa always lead the rest ones in the continent. Northern African countries are always in the top 25% of the rankings, with Egypt, Morocco, Algeria and other northern African countries having a leading edge in their digital economy development. The digital economy development of the southern African countries is also above Africa's average, but there is a significant difference among these countries while the digital economic development level among countries in northern Africa is relatively even. South Africa has an outstanding lead in this regard, especially in the construction and development of digital infrastructure. For example, South Africa had 221.12 safe servers per one million people in 2014, far greater than the average of 16.3 in other southern African countries and the average of 11.75 in the rest African countries during the same period. The eastern African countries are still in the catching-up stage in the overall development of the digital economy, but their potential should not be underestimated. According to the research conducted by the World Bank, the digital unification of the eastern African countries will bring a GDP growth as high as US\$2.6 billion for this region and create 4.5 million new employment opportunities, which will greatly benefit the low-income groups. However, when we review the development of eastern Africa country by country, we find that the digital economy development level in Kenya and Ethiopia is relatively good. Kenya in particular, has made remarkable progress in digital finance, mobile payment and other areas. But Burundi is relatively lagging behind in its digital economy development as the country's internet penetration rate is quite low. Compared to other African regions, western and central African countries are experiencing a relatively slow development of their digital economy. Although Nigeria and Ghana are performing well and Senegal and Cote d'Ivoire are making some progress in this sector, there is still a big gap between them and northern and southern African countries. It shows that Africa's digital economy development still faces a significant imbalance among the regions, and the land-locked developing countries and least developed countries in the continent have obvious disadvantages when developing their digital economy.



**Fig 1.4 An Overall Evaluation of Digital Economy Development in the African Regions**

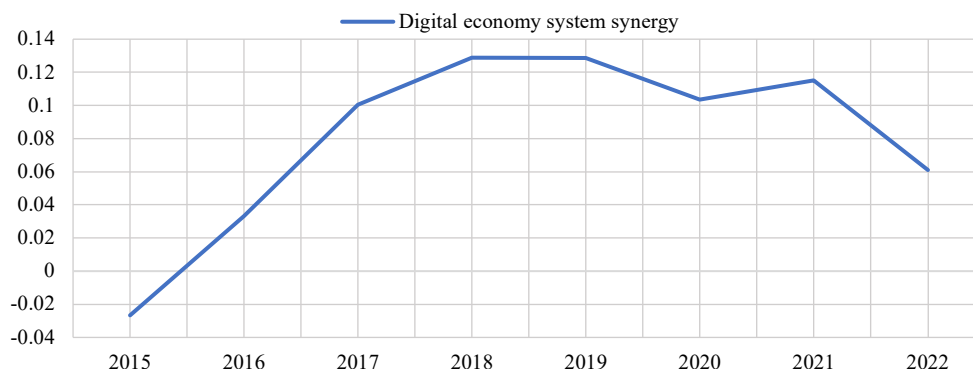
In addition, Africa’s digital foundation score is almost the same as its digital application score if we check the score of each constituent part of the digital economy comprehensive evaluation index (Fig 1.5). Compared to digital application, the score of Africa’s digital foundation keeps a steady trend as it experienced a small growth between 2015 and 2016 when the affordability of internet cost in African countries improved significantly, such as monthly contract phone deals dropping from US\$5.46 to US\$4.93 in Kenya and broadband deals decreasing from US\$6.5 to US\$4.99 in Egypt. As the weight of digital infrastructure reduced between 2016 and 2019, the differences in digital economy development among the countries were also gradually narrowing. The score of Africa’s digital infrastructure picked up slowly after 2019 as the overall network coverage and internet performance made significant headway. Digital application in Africa experiences fluctuating scores, which reflects an obvious difference in policy, investment and development speed in the digital application fields of the African countries. Comparing to digital foundation and digital application, digital innovation in Africa receives a relatively low score, which reflects the indicators of Africa’s digital innovation capacity didn’t make significant progress during the investigation, but we estimate Africa’s digital innovation capacity will gradually improve with more policy support and international cooperation.



**Fig 1.5 The Score of the Sub-indicators of Africa’s Digital Economy Comprehensive Development Index**

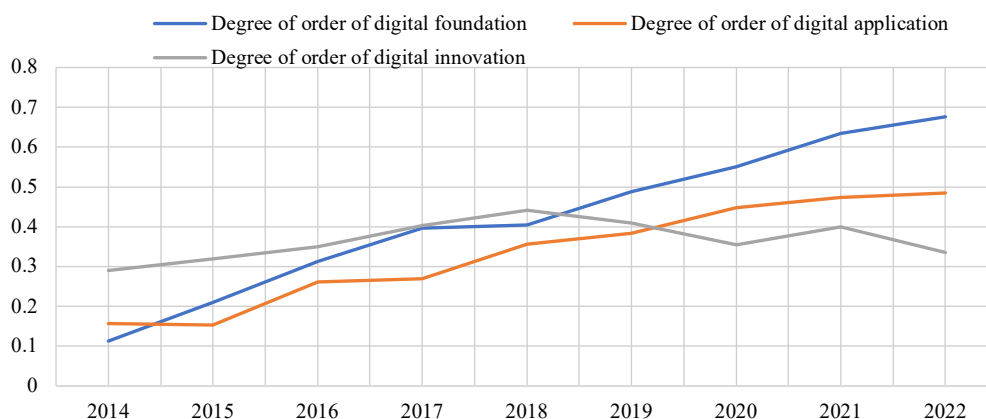
## (2) Africa's Digital Economy Development is Undermined by the Buckets Effect and the Systematic Development Imbalance Should Raise Concern

We measure and calculate the development coordination among the sub-systems of digital foundation, digital application and digital innovation from a dynamic perspective (Fig 1.6), and we find that Africa's digital economy development is at a mildly synergistic state in the period of (-0.04, 0.14). And Africa's digital economy development coordination shows a trend of increasing at first before declining.



**Fig 1.6 Africa's Digital Economy Development Coordination**

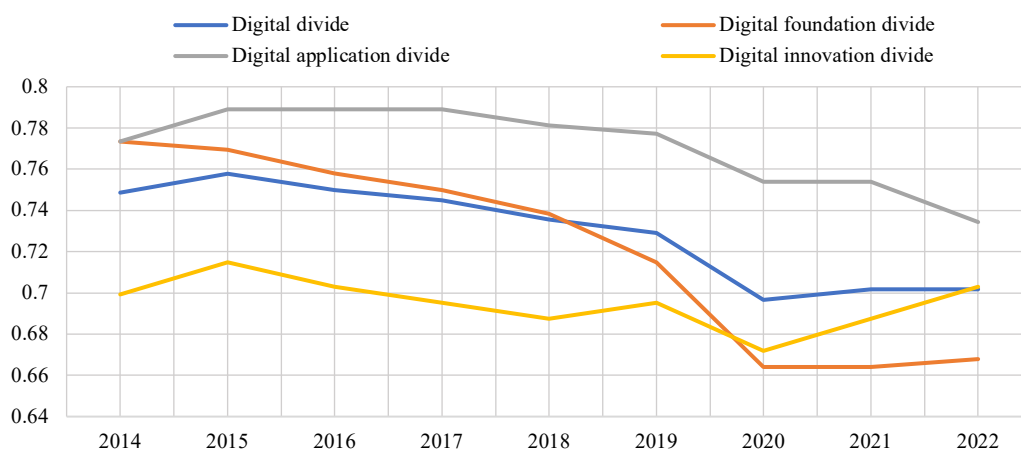
After we analyze the cause of low coordination of Africa's digital economy development, we find that Africa's digital economy development is undermined by the "buckets effect" and inadequate digital innovation capacity is the "shortest board". Comparing the development of degree of order of the three sub-systems (Fig 1.7), we see that the sub-system of Africa's digital innovation can keep a steadily growing trend when the degree of order of the sub-system of digital foundation and the sub-system of digital application are less developed, but when the degree of order of other sub-systems in digital economy system is higher than their development level, the degree of order of the sub-system of digital innovation shows a clear trend of declining. It indicates that the sub-system of Africa's digital innovation cannot evolve in coordination with other sub-systems in the digital economy system, which is the cause of Africa's digital economy system coordination reaching an infection point and showing a downward trend.



**Fig 1.7 The Degree of Order of the Sub-systems of Africa's Digital Economy**

### (3) A Severe “Digital Divide” with a Multi-layered Structure

The state of Africa’s digital divide is evaluated in this report by taking the reference of the world’s average(Fig 1.8). We find a large gap between the development of Africa's digital economy and the world’s average, but the gap has been narrowed between 2014 and 2022. Judging by the development of Africa’s digital divide from various dimensions, the gap between the development of Africa’s digital foundation and the world’s average at early stage is the biggest, but its narrowing speed is fast, which shows Africa has made significant headway in digital interconnection. However, there is still a significant difference between Africa’s digital application and the rest of the world, and the gap-bridging speed is slower than that of digital foundation, which indicates a mismatch between Africa’s digital application capabilities and its digital infrastructure construction. According to the data provided by the report of The Shift of Africa’s Mobile App Market in 2023 released by data insight platform DataSparkle, we find that the game apps experienced the fastest active user growth in Africa between 2021 and 2022, followed by the pan-entertainment apps. The transportation, education and financial apps lagged far behind them in terms of active users, which also reflects the lack of diversity in Africa’s digital application capabilities. Africa’s digital innovation divide was narrower than other types of digital divide at early stage, and the cause for that is the important indicators reflecting Africa’s digital innovation level, labor force participation rate and education expenditure as a share of GDP, were relatively stable during the investigation and the gap between Africa and the world’s average was not big. However, with the improvement of digital innovation environment in the world, the proportion of business establishment procedures declined from 32.8% to 19.8%, the college admission rate rose from 35.6% to 41.8%, the papers published by the sci-tech journals had an increase more than 30%, but Africa’s development in these dimensions is relatively slow, which causes the trend of Africa’s digital innovation divide is constantly broadening. All in all, Africa’s digital technology application and innovation capabilities are inadequate while its digital technology accessibility is significantly increasing, and Africa has both a “digital divide” in a geographical sense and a “digital divide” caused by insufficient application and integration of digital technologies.



**Fig 1.8 The Score of the Sub-indicators of Africa’s Digital Economy Comprehensive Development Index**

## 1.4.2 The Characteristics of Africa’s Digital Finance Development

### (1) A Three-layer Pipeline Feature for Africa’s Digital Finance Development at the National Level with South Africa and Kenya Leading the Pack

According to the measured and computed result based on the available data, we find a three-layer pipeline feature for Africa’s digital finance development at the national level. South Africa, Kenya, Botswana, Nigeria and Uganda all score over 0.3 and stay in the top layer of the pipeline, among which South Africa and Kenya score 0.59 and 0.51 respectively, showing a significant edge; Cote d’Ivoire, Ghana, Zambia, Rwanda, Senegal, Malawi and Tanzania score between 0.25 and 0.28 and they stay in the middle layer of the pipeline with a similar development level; Egypt, Niger, Eswatini and the rest African countries have a score lower than the average value of African countries’ digital finance development index, and they stay in the bottom layer of the pipeline. Compared to the previous year, South Africa and Kenya still keep their lead based on their relatively advanced financial service and digital infrastructure construction, but other African countries show a strong momentum in their digital finance development and the gap between the two sides is narrowing<sup>1</sup>. Botswana works hard to develop its digital infrastructure. The National Data Center of Botswana opened in 2023, which makes its network data exchange no longer relies on the data centers of other African countries. It also ensures a significant improvement of data reading efficiency and user experience of internet access, and provides a huge data storage space for large-sized enterprises to support local digital finance development. The digital financial service in Nigeria is booming thanks to its growing fintech ecosystem which consists of its advanced fintech, mobile payment, digital banking, commercial solutions, personal financial business and other services.

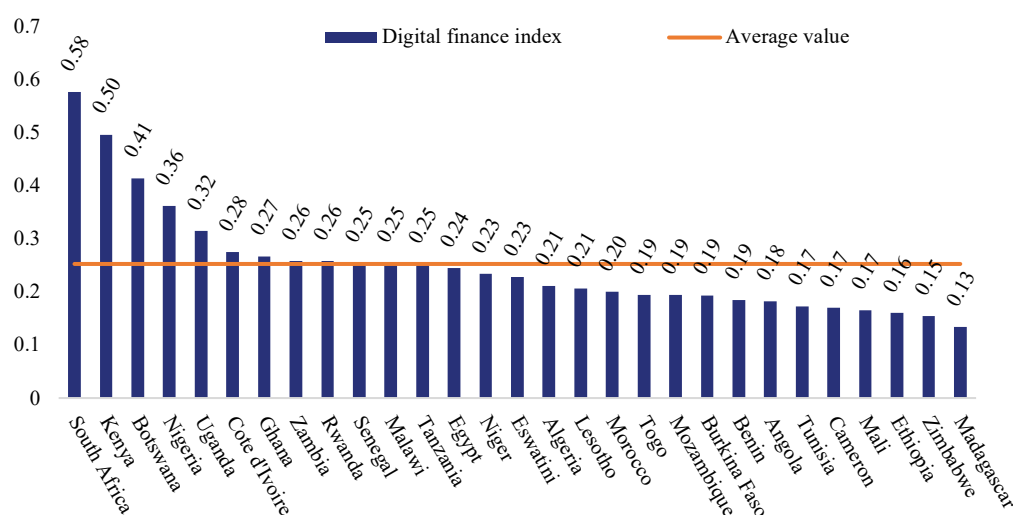


Fig 1.9 The Evaluation of Africa’s Digital Finance Development

<sup>1</sup> China-Africa Economic & Trade Research Institute, Hunan University, Africa Digital Economy Development Index and China-Africa Digital Economy Cooperation Report (2023)

## (2) There Is a Mismatch of Digital Finance Development in Various Dimensions in Some African Countries and Their Huge Potential Is Yet to be Tapped

When we compare the digital finance development indicators in different dimensions of the African countries, we find that despite the fact that some of them have a strong development momentum in the traditional finance sector, their digital infrastructure is lagged or their fintech application is quite low, which causes inadequate capabilities to digitalize their traditional financial service. For example, Rwanda ranks seventh in financial development among African countries, but it has a very backward digital infrastructure; the broadband speed for foreign websites per internet user in Rwanda in 2021 was 16.9kbit/s, which was far behind Africa's average of 79.87kbit/s, but its SIM only deals and broadband deals both exceeded Africa's average; according to the data provided by DataSparkle platform, the usage of financial apps in Rwanda were well below Africa's average level, which may have something to do with the low level of construction of digital infrastructure in this country. It causes inadequate integration of traditional financial service and internet technology and ICT in Rwanda, making the country unable to digitalize its traditional financial service. The mismatch of digital economy development in different dimensions holds back digital finance development, and these countries should therefore intensify their digital infrastructure construction, reduce the usage cost of digital equipment and encourage fintech innovation to release their potential for digital finance development.

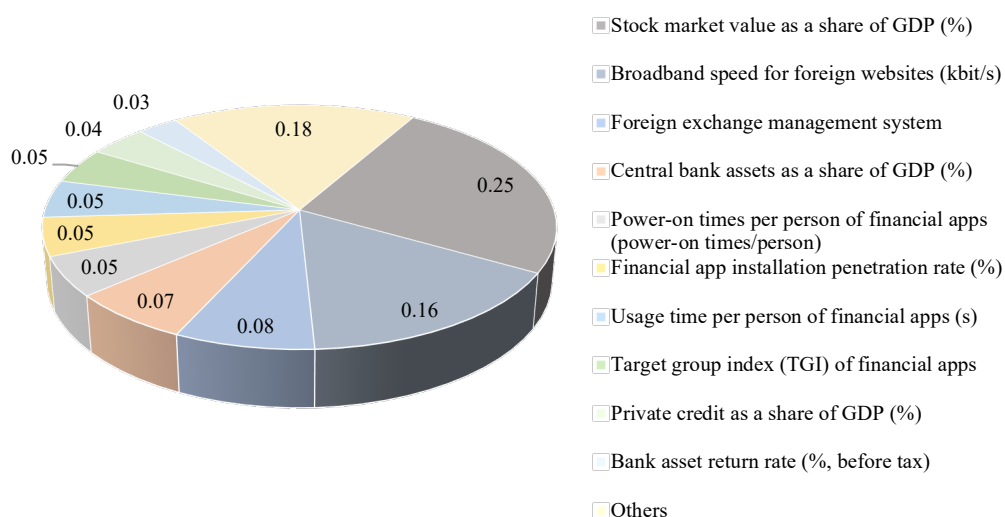
**Table 1-7 The Score of the Sub-indicators of Africa's Digital Finance Development Evaluation Index**

Country	Digital finance index		Degree of financial development		Level of digital Infrastructure		Degree of fintech application	
	Score	Ranking	Score	Ranking	Score	Ranking	Score	Ranking
	South Africa	0.578	1	0.411	1	0.061	4	0.105
Kenya	0.497	2	0.184	5	0.201	1	0.113	4
Botswana	0.415	3	0.185	4	0.102	2	0.128	3
Nigeria	0.362	4	0.124	17	0.030	20	0.207	1
Uganda	0.315	5	0.149	12	0.086	3	0.080	9
Cote d'Ivoire	0.275	6	0.142	15	0.045	9	0.089	6
Ghana	0.268	7	0.153	10	0.048	7	0.066	11
Zambia	0.259	8	0.169	8	0.040	13	0.050	13
Rwanda	0.258	9	0.180	6	0.035	17	0.044	17
Senegal	0.254	10	0.063	29	0.041	12	0.151	2
Malawi	0.253	11	0.207	2	0.028	22	0.018	28
Tanzania	0.253	12	0.167	9	0.027	24	0.059	12
Egypt	0.245	13	0.169	7	0.048	8	0.027	22
Niger	0.235	14	0.203	3	0.013	29	0.019	27
Eswatini	0.229	15	0.148	14	0.037	15	0.044	15

### (3) Traditional Financial Service Lays the Foundation for Digital Finance and Fintech Is the Main Driver for the Transformation

From the weighting score of each indicator, we can know that the degree of traditional financial service development has the highest score. The percentage of the top ten third-level indicators by weight is 82.49%, among which the share of the degree of traditional financial service development is 46.47%, the share of the level of fintech application 20.04%, and the share of the level of digital infrastructure 15.98%. The establishment of a traditional financial system can provide demonstration and guidance on qualifications, responsibilities and standards for digital financial service providers. These fundamental frameworks offer necessary infrastructure and experience building for the development of digital finance.

The breadth and depth of fintech application in African countries are improving. According to the data released by DataSparkle platform, the financial apps in African countries in 2023 have a wider coverage and are more widely used. Compared to the data of 2022, there is a significant improvement in installation penetration, active usage, average usage time per person and power-on times per person of financial apps in Africa. The State of the Industry Report on Mobile Money 2024 released by GSMA also points out that newly registered accounts and the share of active users in the recent 30 days in western African have risen sharply since 2021. Over one third of newly registered accounts and active accounts in the recent 30 days came from western Africa in 2023, and the region has led the growth of mobile money usage for the past few years<sup>1</sup>. The booming scene of Africa’s fintech is a result of its high digital payment penetration and the flourishing innovative spirit, which makes financial service more convenient, prevalent and personal. The increasing efficiency of financial service powered by fintech in an innovative way promotes the digitalisation of traditional financial service.



**Fig 1.10 The Weight Distribution of the Three-layered Indicators of Digital Finance**

<sup>1</sup> GSMA, The State of the Industry Report on Mobile Money 2024, <https://www.gsma.com/sotir/#download>

**Table 1-8 Financial Apps Usage in Certain African Countries**

Country	TGI (%)		Penetration rate of installation (%)		Usage time per person (min)		Power-on times per person (power-on times)	
	2022	2023	2022	2023	2022	2023	2022	2023
	South Africa	53.39%	53.56%	54.28%	54.38%	330.81	350.05	267.7
Kenya	67.45%	68.94%	68.27%	70.66%	210.56	220.59	196.6	207.9
Botswana	44.12%	50.56%	45.97%	52.11%	593.94	613.48	315.4	343.5
Nigeria	77.79%	84.26%	82.71%	87.90%	566.80	868.70	463.1	695.8
Uganda	47.34%	54.29%	46.48%	57.57%	139.10	117.34	97.9	80.5
Cote d'Ivoire	53.75%	54.23%	54.65%	56.50%	107.01	126.71	103.1	122.8
Ghana	39.26%	44.95%	40.29%	47.48%	135.95	117.30	85.5	81.4
Zambia	24.32%	34.08%	25.86%	34.37%	131.49	114.26	77.9	74.8
Rwanda	28.17%	27.47%	28.98%	29.41%	183.41	165.57	112.9	106.3
Senegal	78.48%	80.59%	76.70%	79.49%	221.71	263.61	259.1	314.3
Malawi	12.93%	13.16%	14.91%	15.62%	124.05	100.93	80.6	74.6
Tanzania	30.23%	43.70%	30.98%	46.37%	135.61	107.56	95.3	82.4
Egypt	19.62%	23.58%	18.33%	24.43%	78.95	92.53	72.1	87.2
Niger	17.03%	17.28%	18.26%	19.66%	69.52	122.88	58.3	103.3
Eswatini	15.84%	19.42%	17.19%	19.56%	260.86	275.47	149.9	157.5
Average growth rate	—	9.90%	—	11.48%	—	11.16%	—	15.00%

As to digital finance development, the score of digital finance development index of the countries in the leading-coordinating zone varies between 0.21 and 0.50 with Kenya having an absolute advantage. The relatively high level of Kenyan financial development has laid a solid foundation for its digital finance development. The country also has many fintech companies providing lending, investment, insurance and other financial services, and they are eventually transformed into high-level and new digital finance business forms with the support of digital technologies. The relatively low level of fintech application in Algeria holds back its digital finance development.

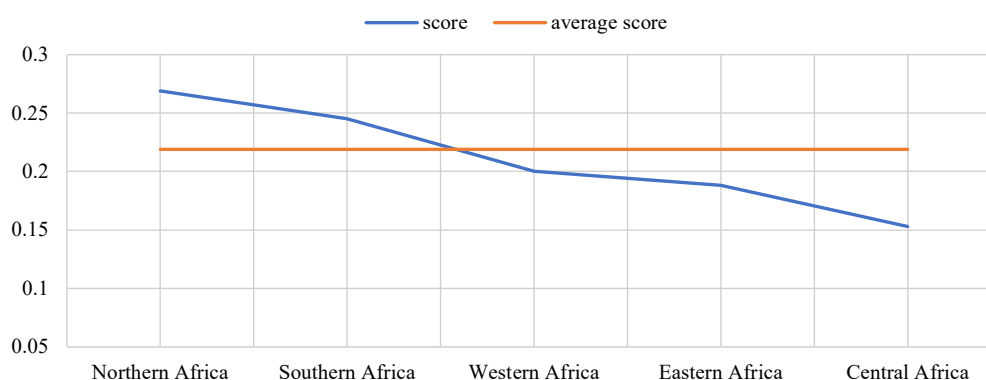
### **1.4.3 The Characteristics of Africa's Digital Consumption Development**

#### **(1) There is an Imbalance in Africa's Digital Consumption Development and the Carrying Capacity of Digital Consumption Scenes is the Driver of Africa's Digital Consumption Development**

If we review the digital consumption in Africa region by region, we can see that there is a development imbalance among them with more advanced development in the southern and northern regions, and more backwardness in the eastern and western regions. The digital consumption development level in southern and northern Africa is above Africa's average level (a score of 0.219). Specifically, the digital consumption development level in northern Africa maintains a relatively leading status. Four northern African countries in the 31 sample countries

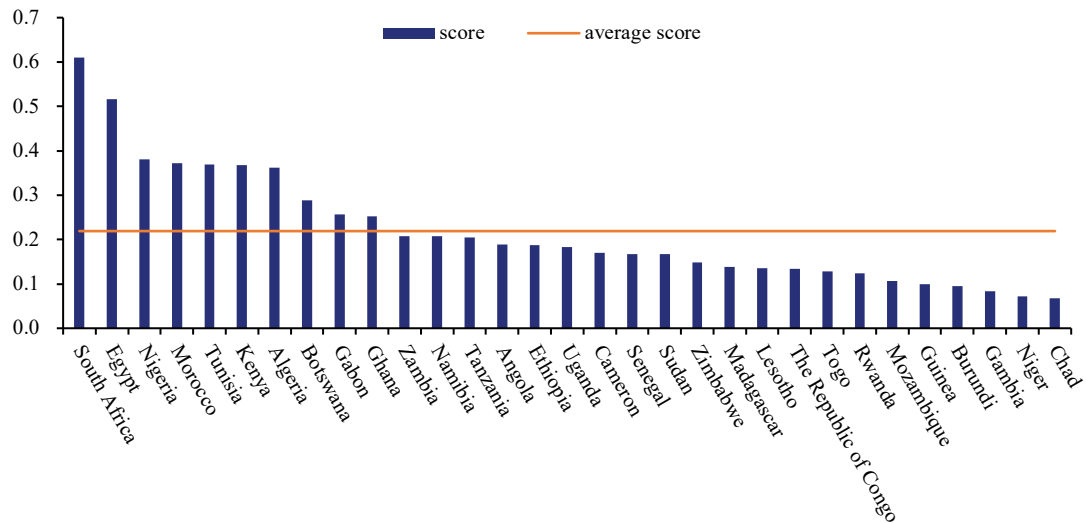


for the measuring and calculation rank in the top ten, with Sudan, the remaining northern African country, in between. There are large differences in digital consumption development among southern African countries, among which South Africa has an absolute advantage. The digital consumption development of eastern African countries is at the middle level in Africa. The digital consumption development of western and central Africa is relatively lagging. Nigeria and Ghana have a relatively high level in this regard, but there are still certain gaps when compared with the countries in northern or southern Africa. The countries with a relatively high level of digital consumption development are concentrated in northern Africa, and the ones with relatively backward digital consumption development are mostly in western Africa. There is an imbalance of digital consumption development among the regions in Africa.



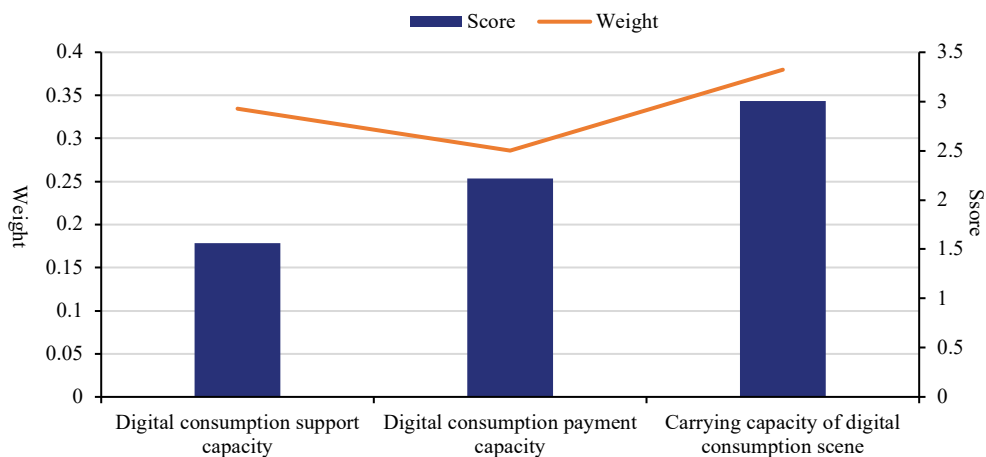
**Fig 1.11 The Score of Digital Consumption Development of the African Regions**

When we review the data country by country, we see that there is a development imbalance of digital consumption among the African countries as only 10 of them exceed Africa's average level (a score of 0.219). They can be divided into four levels according to their score: South Africa and Egypt are firmly placed in the first level due to their huge lead; Nigeria, Morocco, Tunisia, Kenya, Algeria, Botswana, Gabon and Ghana exceed Africa's average level (0.219), so they are placed in the second level for their relatively high development level of digital consumption; the score of Zambia, Namibia, Tanzania, Angola, Ethiopia, Uganda, Cameroon, Senegal and Sudan varies between 0.16 and 0.21, and they are placed in the third level as their digital consumption development is at the middle level of Africa; the score of Zimbabwe, Madagascar, Lesotho, The Republic of Congo, Togo, Rwanda, Mozambique, Guinea, Burundi, Gambia, Niger and Chad varies between 0.067 and 0.15, so they are placed in the fourth level due to their relatively backward digital consumption development. From the perspective of geography, the coastal countries of southern Africa and the coastal countries of northern Africa have a relatively high level of digital consumption development. If we review the data from economic development level, the digital consumption development of landlocked developing countries and least developed countries in Africa is relatively backward.



**Fig 1.12 The Score of Digital Consumption Development Index of the African Countries**

In addition, if we review the development from the score and weight of first-level indicators of Africa’s digital consumption development evaluation system (Fig 1.13), we find that the score of the carrying capacity of digital consumption scene is the highest, which means, generally speaking, the carrying capacity of digital consumption scene is the main factor affecting the development of digital consumption in African countries. If we review the score weight of the first-level indicators. we find that the weight of the carrying capacity of digital consumption scene is the highest, which indicates large differences in the development of carrying capacity of digital consumption scene among the African countries and it plays the most important role in the comprehensive evaluation system of Africa’s digital consumption development.



**Fig 1.13 The Score and Weight of the First-level Indicators of Africa’s Digital Consumption Development Evaluation System**

**(2) Coordination in digital consumption growth to be enhanced, and growth edges in some Africa countries to be released**

Table 1-9 reveals a lack of high coordination in digital consumption growth across African nations, where each country encounters its own specific shortcomings. For example, Botswana’s digital consumption growth is notably impeded by a moderate capacity of Ecosystem Support, despite its high rankings in Assurance Measures and Ability to Pay. Nigeria and Gabon have high scores in Ability to Pay, but their Assurance Measures are only average, suggesting a need for enhancement. Kenya and Tunisia, conversely, exhibit relative weaknesses in Ability to Pay.

**Table 1-9 Scores and Rankings of the Top 10 Countries in Each Indicator**

Country	Region	Assurance Measures		Ability to Pay		Ecosystem Support		Overall Score	
		Score	Rank	Score	Rank	Score	Rank	Score	Rank
South Africa	Southern Africa	0.214	1	0.195	3	0.201	2	0.610	1
Egypt	Northern Africa	0.083	6	0.212	1	0.221	1	0.516	2
Nigeria	Western Africa	0.040	13	0.195	2	0.146	6	0.381	3
Morocco	Northern Africa	0.088	4	0.122	5	0.162	3	0.372	4
Tunisia	Northern Africa	0.112	3	0.104	8	0.153	4	0.369	5
Kenya	Eastern Africa	0.129	2	0.086	10	0.152	5	0.367	6
Algeria	Northern Africa	0.086	5	0.138	4	0.138	7	0.362	7
Botswana	Southern Africa	0.083	7	0.111	6	0.094	13	0.288	8
Gabon	Central Africa	0.038	15	0.109	7	0.110	11	0.257	9
Ghana	Western Africa	0.052	9	0.081	11	0.119	10	0.252	10

**(3) Entertainment & gaming and social media apps as digital consumption darlings in Africa**

Data from DataSparkle indicate that entertainment & gaming and social media apps are at the forefront of digital consumption in Africa, with marked edges in installation penetration rate, active user rate, per capita time spent, and per capita frequency of apps being launched. Strikingly, nations with less developed economies demonstrate equivalent engagement with these apps as those with stronger economies, but with a significantly lower Ability to Pay. This points to a demand for such apps in underdeveloped regions, yet with constrained financial backing. Furthermore, these apps have the lowest weighting in Ecosystem Support, suggesting widespread adoption and minimal development disparities across Africa.

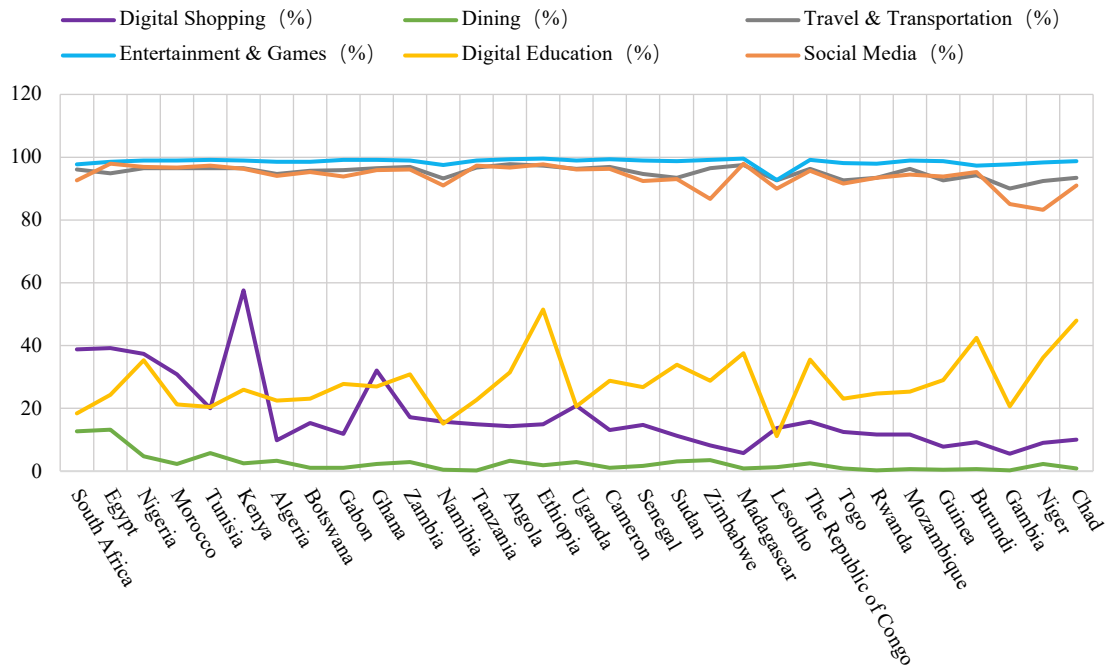


Fig. 1.14 Installation Penetration Rate by Application and by Country (%)

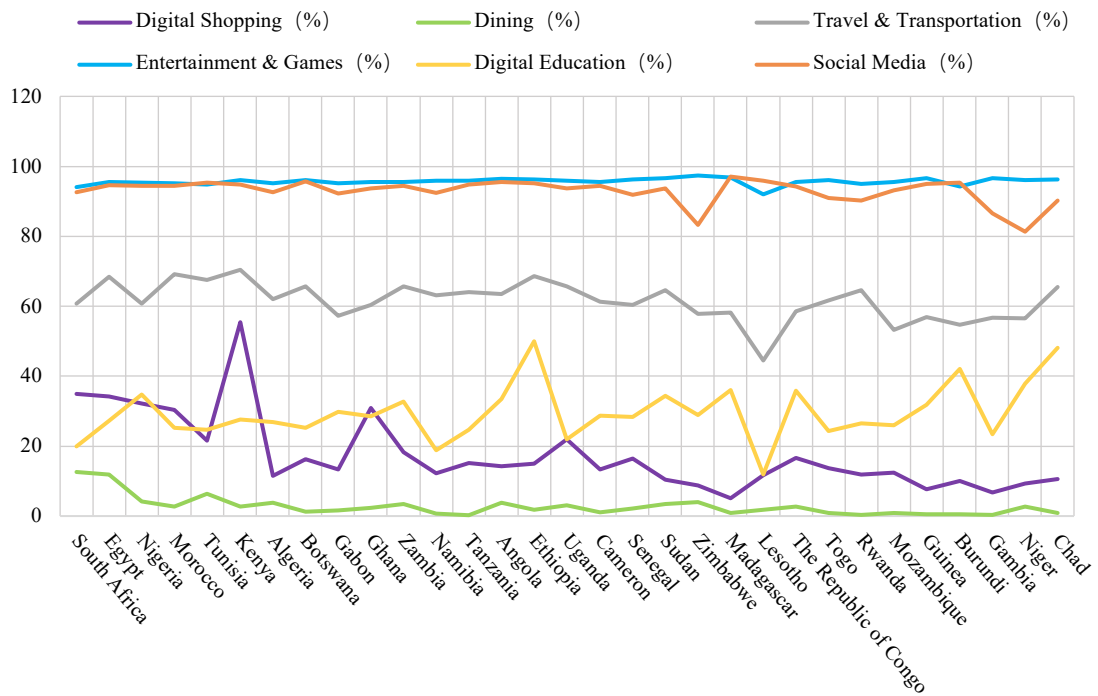
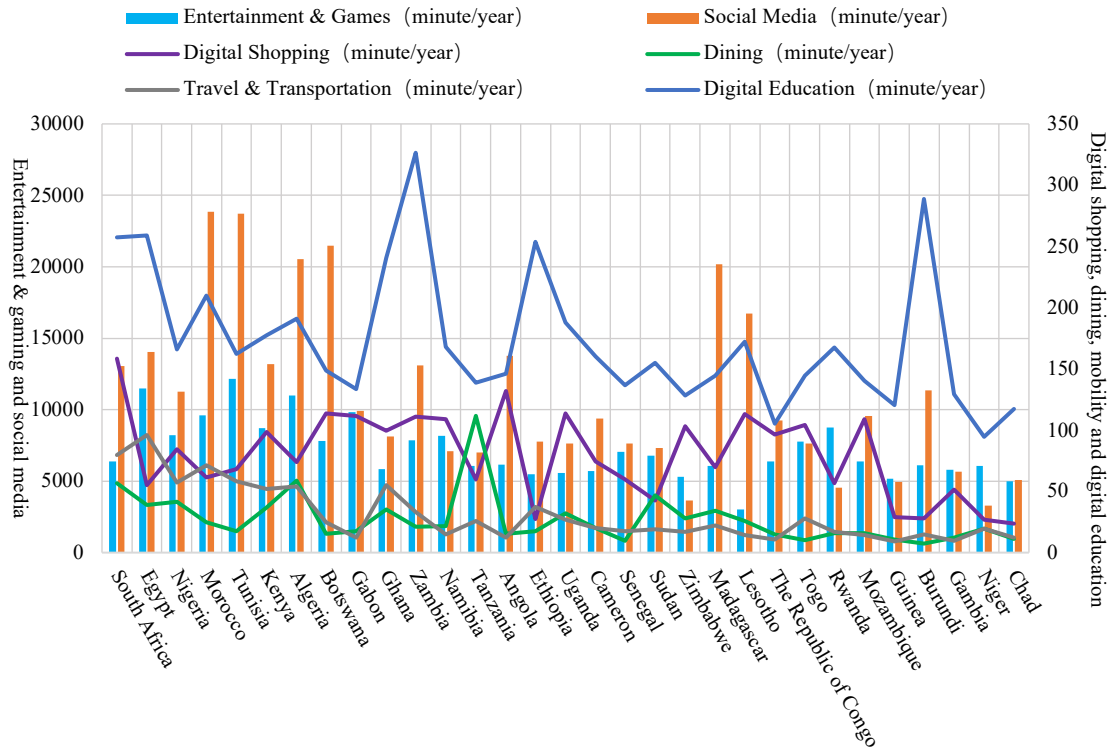
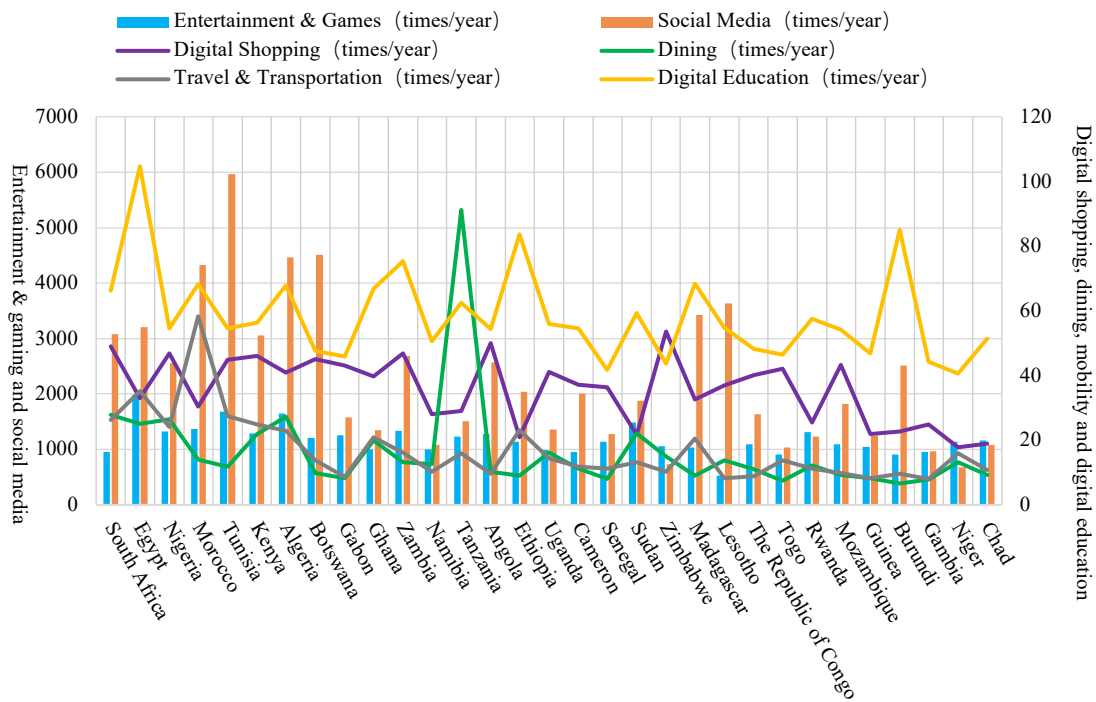


Fig. 1.15 Active User Rate by Application and by Country (%)



**Fig. 1.16 Per Capita Time Spent by Application and by Country (minute/year)**



**Fig. 1.17 Per Capita Frequency of Applications Being Launched by Application and by Country (times/year)**

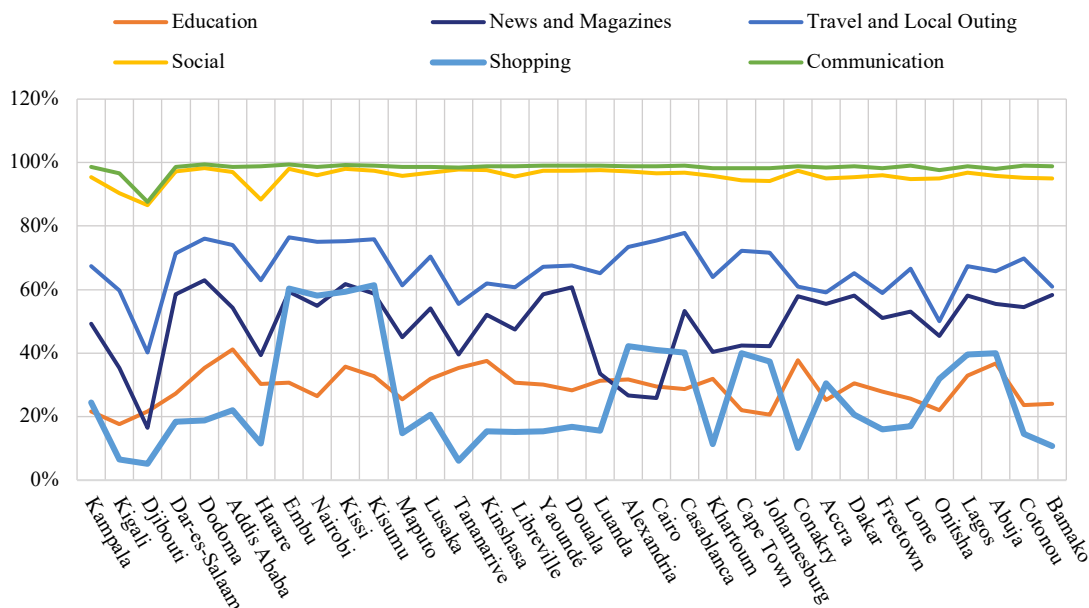
#### **1.4.4 Characteristics of digital economy development in African cities**

##### **(1) Education apps as an emerging focus in African key cities, following communication and social media apps**

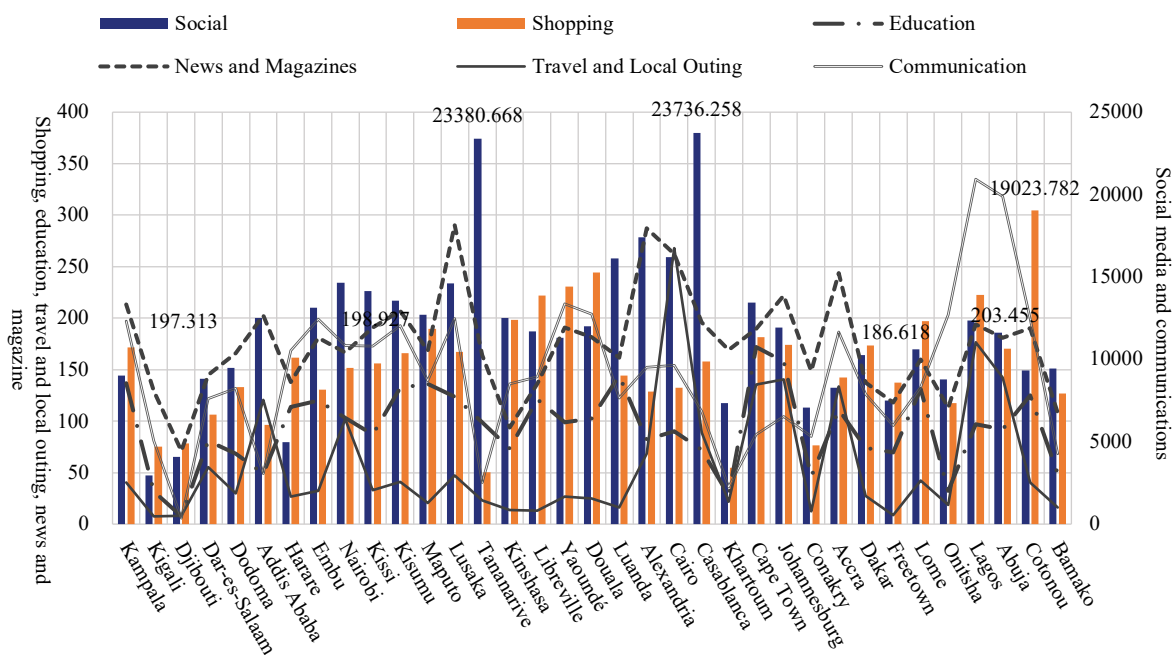
Communication and social media apps in many key African cities have secured active user rates exceeding 90%. Users in Antananarivo (Madagascar) and Casablanca (Morocco) stand out for spending the most time on social media apps on average. Those in Cotonou (Benin) are recognized for having the longest average spending time on communication apps. Shopping apps in many key African cities have secured active user rates of around 40%, with some cities even surpassing 60%. These include Kenya's Kisumu, Embu, Nairobi, and Kisii; Nigeria's Lagos and Abuja; South Africa's Cape Town; Egypt's Alexandria and Cairo; and Morocco's Casablanca. Higher active user rates for education apps have surpassed 35% in several key cities, including Addis Ababa in Ethiopia, Conakry in Guinea, Kinshasa in the Democratic Republic of the Congo, Abuja in Nigeria, Kisii in Kenya, Dodoma in Tanzania, and Antananarivo in Madagascar, with Addis Ababa exceeding 40%. Higher active user rates for travel and local outing apps have exceeded 75% in several major cities, including Casablanca in Morocco, Nairobi, Embu, Kisii, and Kisumu in Kenya, Dodoma in Tanzania, and Cairo in Egypt. Higher active user rates for news and magazine apps have surpassed 60% in key cities, such as Dodoma in Tanzania, Kisii in Kenya, and Douala in Cameroon. Furthermore, compared to 2022<sup>1</sup>, education apps have replaced news and magazine ones as the category with the longest average time spent per user across cities. This trend underscores the importance and popularity of education apps in Africa's digital ecosystem. As digital tech advances and spreads, education apps are gaining favor for acquiring knowledge, honing skills, and personal development, affirming their status as an essential part of daily life.

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<sup>1</sup> Research Group of China-Africa Economic and Trade Cooperation Research Institute, Hunan University, Report on Africa Digital Economy Development Index and China Africa Digital Economy Cooperation (2023)



**Fig. 1.18 Active User Rate in Key African Cities by Application (%)**

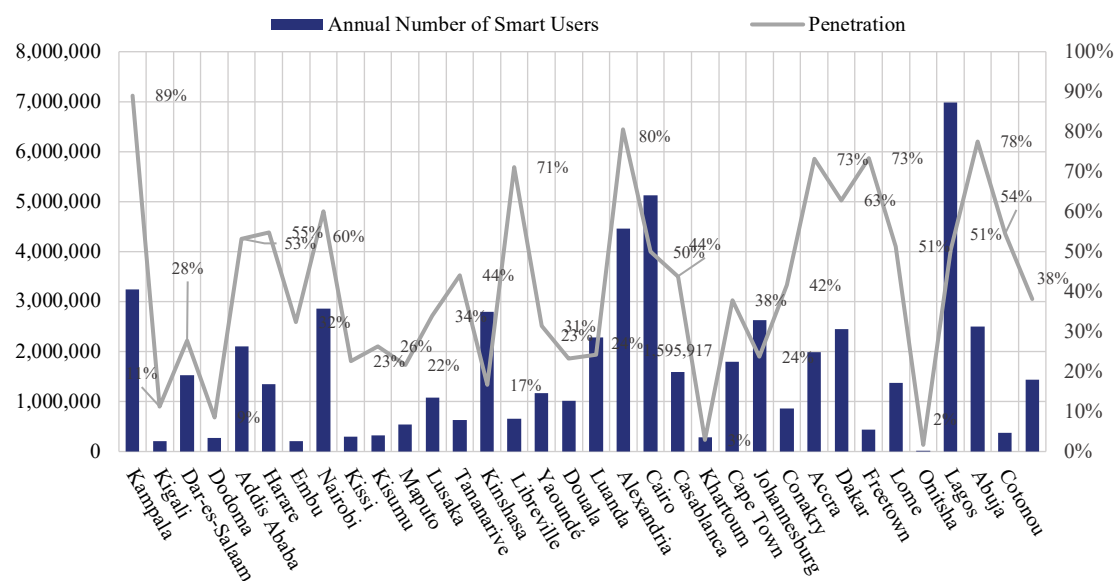


**Fig. 1.19 Per Capita Time Spent in Key African Cities by Application (minute/year)**

**(2) Lagos and Cairo as pioneers in smart phone usage among key African cities**

Smart phones, pivotal to the digital economy, handle the bulk of Internet access in Africa and are a fundamental support for urban digital initiatives. Smart phone users in African cities vary

significantly, with most having less than two million. Yet, Lagos and Cairo lead with over five million each. In North Africa, cities like Alexandria and Cairo are notable for their high counts of smart phone users, both surpassing the four million mark. The West African region shows a significant upward trend, with Abuja and Dakar emerging alongside Lagos in the top 10 for smart phone adoption. However, Internet penetration rates do not align with the smart phone user base. Kampala in Uganda is exceptional with an 89% Internet penetration rate. As illustrated in Table 1-10, 14 cities have rates over 50%, with a majority located in Western and Eastern Africa.



**Fig. 1.20 Number and Penetration of Smart Phones in Key Cities in Africa (%)**

**Table 1-10 Cities with More Than 50% Penetration of Smart Phones**

Country	City	Annual Smart Phone User Penetration
Uganda	Kampala	89%
Egypt	Alexandria	80%
Nigeria	Abuja	78%
Sierra Leone	Freetown	73%
Ghana	Akkra	73%
Gabon	Libreville	71%
Senegal	Dakar	63%
Kenya	Nairobi	60%
Zimbabwe	Harare	55%
Benin	Cotonou	54%
Ethiopia	Addis Ababa	53%
Togo	Lomé	51%
Nigeria	Lagos	51%
Egypt	Cairo	50%



### (3) Mobile data is more popular than Wi-Fi in key African cities for Internet traffic consumption

Looking at Internet traffic consumption, cities in Africa show a wide range of preferences, with Lagos in Nigeria topping the list for per capita mobile data consumption at 79.35GB, while its Wi-Fi consumption per capita is at 36.42GB. There’s been a modest rise in both types of data consumption since 2021, but Wi-Fi consumption still has not reached half of the mobile data consumption levels. Cairo in Egypt has the highest per capita Wi-Fi consumption at 188.42GB, contrasting with its mobile data consumption at 33.80GB. Notably, 13 cities, including Alexandria, Cairo, Casablanca, Lomé, Libreville, Cape Town, Addis Ababa, Nairobi, Johannesburg, Dakar, Bamako, Harare, and Cotonou, have higher per capita Wi-Fi consumption than mobile data. The remaining 22 cities favor mobile data. This indicates a prevalent consumption of mobile data across most African cities, even as Wi-Fi consumption is on the rise. Geographically, cities in North Africa are significantly heavier consumers of Wi-Fi traffic, outpacing other regions.

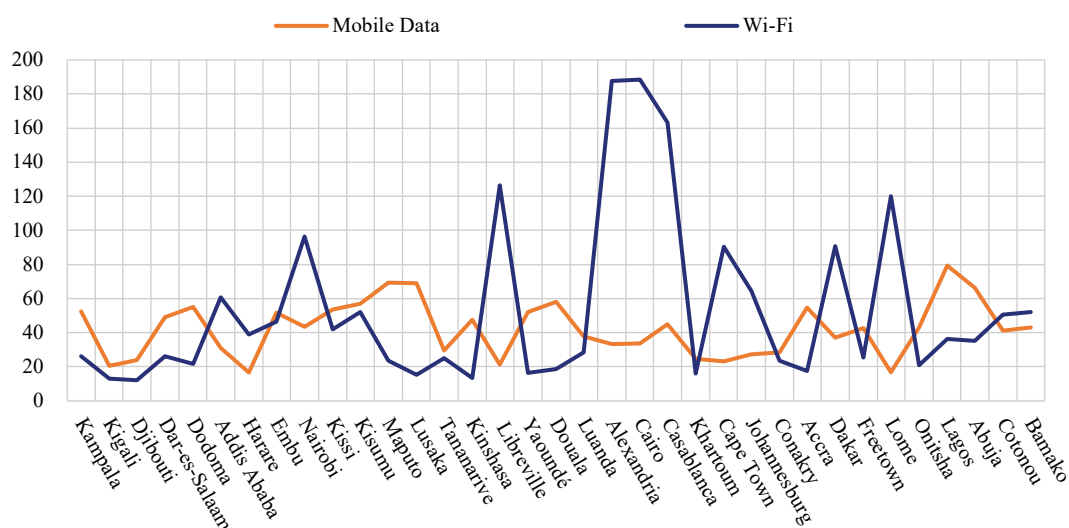


Fig. 1.21 Mobile Data and Wi-Fi Consumption Per Capita (GB) in Key African Cities in 2023

## 1.5 Overall Development of the Digital Economy in Africa and Analysis of Key Cities by Country

### 1.5.1 Analysis of overall development

This report provides an analysis of the overall development of Africa’s digital economy by synthesizing the evaluation results from 2014 to 2023, which include evaluation of the digital economy, coordinated development, and the digital divide. Table 1-11 presents the comprehensive evaluation results of the digital economy development in Africa. Firstly, based

<sup>1</sup> Research Group of China-Africa Economic and Trade Cooperation Research Institute, Hunan University, Report on Africa Digital Economy Development Index and China Africa Digital Economy Cooperation (2023)

on the calculation results of Composite Development Index for the Africa Digital Economy, the Digital Finance Development Index, and the Digital Consumption Development Index, African countries are grouped into leading countries (top 25% of the evaluation index), catch-up countries (evaluation index ranking between the top 25% and 75%), and beginner countries (bottom 25% of the evaluation index). Secondly, the calculation results of the coordinated development in the digital economy are used to group African countries into coordination zones (positive) and adjustment zones (negative). Lastly, based on the evaluation results of the digital divide, countries are grouped into those with a low divide (top 25% with smaller disparities), medium divide (disparities falling between the top 25% and 75%), and high divide (bottom 25% with larger disparities). Further classification is made according to the digital composite index and the degree of coordinated development.

**Table 1-11 Holistic Analysis of the Development of the African Digital Economy**

Country	Digital Composite Index	Digital Financial Index	Digital Consumption Index	Coordinated Development	Digital Divide Degree	Key Cities
South Africa	Leading	Leading	Leading	Coordination zone	Low divide	Cape Town, Johannesburg
Tunisia	Leading	Beginner	Leading	Coordination zone	Low divide	—
Egypt	Leading	Catch-up	Leading	Coordination zone	Low divide	Alexandria, Cairo
Morocco	Leading	Catch-up	Leading	Coordination zone	Low divide	Casablanca
Kenya	Leading	Leading	Leading	Coordination zone	Low divide	—
Algeria	Leading	Catch-up	Leading	Coordination zone	Low divide	Embu, Nairobi, Kisii, Kisumu
Botswana	Leading	Leading	Catch-up	Coordination zone	Middle divide	—
Namibia	Leading	—	Catch-up	Coordination zone	Middle divide	Onitsha, Lagos, Abuja
Nigeria	Catch-up	Leading	Leading	Coordination zone	Middle divide	Akkra
Ghana	Catch-up	Leading	Catch-up	Coordination zone	Low divide	—
Senegal	Catch-up	Catch-up	Catch-up	Coordination zone	Low divide	Dakar
Côte d'Ivoire	Catch-up	Leading	—	Coordination zone	Middle divide	Addis Ababa
Ethiopia	Catch-up	Beginner	Catch-up	Coordination zone	Middle divide	—
Mali	Catch-up	Beginner	—	Adjustment zone	Middle divide	Bamako
Cameroon	Catch-up	Beginner	Catch-up	Adjustment zone	Middle divide	Yaoundé, Douala

Lesotho	Catch-up	Catch-up	Catch-up	Adjustment zone	Middle divide	—
Angola	Catch-up	Beginner	Catch-up	Adjustment zone	High divide	Dar es Salaam, Dodoma
Tanzania	Catch-up	Catch-up	Catch-up	Adjustment zone	Middle divide	Kigali
Rwanda	Catch-up	Catch-up	Beginner	Adjustment zone	High divide	Luanda
Uganda	Catch-up	Leading	Catch-up	Coordination zone	High divide	—
Eswatini	Catch-up	Catch-up	—	Coordination zone	High divide	—
Zimbabwe	Catch-up	Beginner	Catch-up	Coordination zone	High divide	Kampala
Niger	Catch-up	Catch-up	Beginner	Adjustment zone	High divide	Harare
Zambia	Catch-up	Catch-up	Catch-up	Coordination zone	Middle divide	—
Burkina Faso	Beginner	Catch-up	—	Coordination zone	Middle divide	Lusaka
Benin	Beginner	Catch-up	—	Adjustment zone	Middle divide	—
Malawi	Beginner	Catch-up	—	Coordination zone	Middle divide	Cotonou
Togo	Beginner	Catch-up	Beginner	Coordination zone	Middle divide	Lomé
Mozambique	Beginner	Catch-up	Beginner	Coordination zone	High divide	Maputo
Madagascar	Beginner	Beginner	Beginner	Coordination zone	High divide	Antananarivo
Guinea	Beginner	—	Beginner	Adjustment zone	Middle divide	Conakry
Burundi	Beginner	Beginner	Beginner	Adjustment zone	High divide	—
Gambia	—	—	Beginner	—	—	—
The Republic of the Congo	—	—	Catch-up	—	—	—
Democratic Republic of the Congo	—	—	—	—	—	Kinshasa
Djibouti	—	—	—	—	—	Djibouti
Gabon	—	—	Catch-up	—	—	Libreville
Sierra Leone	—	—	—	—	—	Freetown
Sudan	—	—	Catch-up	—	—	—
Chad	—	—	Beginner	—	—	—

Countries grouped into leading-coordination zone are recognized by their positive coordinated development and rank in the top 25% for the comprehensive evaluation of the digital economy. This group encompasses South Africa, Tunisia, Egypt, Morocco, Kenya, Algeria, Botswana, and Namibia. These nations are not only advanced in terms of digital economy development but also demonstrate an effective interplay among the three subsystems that form the digital economy framework. They have established a competitive edge over other regions and are leading the charge in advancing Africa's digital economy.

Countries grouped into leading-adjustment zone rank in the top 25% for the digital economy's comprehensive evaluation but with a negative coordinated development, showing a contradiction where their advanced digital economy is at risk of being undermined by internal disharmony. Because this report's evaluation did not identify any countries falling into this category, no specific country analysis will be included in the subsequent text.

Countries grouped into catch-up-coordination zone are those with a positive coordinated development and rank between the 25th and 75th percentiles in the comprehensive evaluation of the digital economy, including Nigeria, Ghana, Senegal, Côte d'Ivoire, Ethiopia, Cameroon, Uganda, Eswatini, Zimbabwe, and Zambia. These nations are considered to be at a mid-tier level in terms of digital economy development. They exhibit a constructive coordination among the three subsystems that constitute the digital economy, positioning them as countries with the potential for future growth in the digital economy sector.

Countries grouped into catch-up-adjustment zone are those with a negative coordinated development but rank between the 25th and 75th percentiles in the comprehensive evaluation of the digital economy. This group includes Mali, Lesotho, Angola, Rwanda, Tanzania, and Niger. Despite being at a mid-level tier in terms of digital economy development, these nations exhibit an uncoordinated evolution among the three subsystems that constitute the digital economy, indicating that while these countries have shown proactive efforts in the digital economy sector, there is an increasing presence of disorder in the system.

Countries grouped into beginners, ranking in the bottom 25% in the comprehensive evaluation of the digital economy, are considered to have relatively lagging levels in the digital economy development. These nations are experiencing stagnation or disorderly development in the evolution of their digital economic systems. The report will not focus on these countries as key partners for China-African cooperation on digital economy.

## **1.5.2 Analysis of key cities by country**

### **(1) Countries grouped into leading-coordination zone and their cities**

Countries grouped into leading-coordination zone are represented by Egypt, South Africa, and Kenya. These nations have demonstrated a significant commitment to fostering a robust digital economy, with government and social engagement at all levels. They have enacted a range of policies and strategies aimed at enhancing the digital economy's growth and actively driving their digital transformation. These initiatives span across various sectors, from education to finance and business, indicating a broad-based approach to development. Moreover, there is a pronounced emphasis on the advancement of cutting-edge technologies such as big data, artificial intelligence, and cloud computing, showcasing a forward-looking strategy in

technology development and application. Table 1-12 shows the recent digital economy policies in these nations.

**Table 1-12 Digital Economy Policies in Countries Grouped into Leading-Coordination Zone**

Country	Strategic planning	Main objective	Year of release
Kenya	Digital Economy Blueprint	The blueprint identifies five key pillars including digital government, digital business, infrastructure, innovation-driven entrepreneurship, and digital skills and values. These are designed to establish a dynamic digital economy aimed at helping Kenya overcome its development challenges and leapfrog its way to progress.	2019
	National Digital Master Plan 2022-2032	The plan serves as a supporting framework for Kenya's ICT system, incorporating an analysis of the obstacles and limitations to achieving the strategic document's objectives within a globally competitive technological landscape. It is aimed at fostering innovative digital transformation.	2022
	Kenya Vision 2030	The master plan prioritizes data protection and cybersecurity as essential pillars of the ecosystem, establishing a clear governance structure and set of rules for effective cyber collaboration.	2008
South Africa	Strategic Plan 2020-2025	The strategy document highlights the need to bolster digital infrastructure, ensuring that students are equipped with the necessary tools for success through the renovation of labs, upgrading of equipment, and enhancement of ICT technologies, all within an environment that is conducive to effective learning and achievement.	2020
	Draft National Data and Cloud Policy	The draft aims to enhance the South Africa's digital service capabilities, elevate its government's data analysis and judgment, and safeguard its data sovereignty and security.	2021
	National Digital and Future Skills Strategy South Africa	The strategy covers the development of digital skills at every level and discusses the intricate connections between digital advancement and social and production sectors.	2020
Egypt	Egypt National Artificial Intelligence Strategy	The strategy aims to establish an AI industry in Egypt, which covers the development of relevant skills, technologies, ecosystems, infrastructure, and governance mechanisms, and to ensure its sustainability and competitiveness.	2021
	Financial Inclusion Strategy (2022-2025)	The strategy emphasizes the importance of establishing a favorable legal and regulatory framework to promote financial technology and digital financial infrastructure, as well as ensuring the availability of sustainable finance and economic stability.	2022
	Digital Egypt Builders Initiative	The plan is designed to promote the development of information and communications technology (ICT) and the telecommunications industry, in support of Egypt's digital transformation strategy.	2020
	Data Protection Law	The law serves as Egypt's first legislation specifically tailored to protect personal data, marking a pivotal advancement in the country's efforts to elevate its domestic data protection measures.	2020

In terms of the digital economy, these nations have established a robust foundation for digital economic growth. They are witnessing a gradual bridging of the digital divide, with ICT equipment and Internet coverage and performance surpassing the African average by a significant margin. These countries have not only accumulated substantial experience in digital

applications but also fostered an environment primed for innovation, showcasing a strong innovative capacity. They are now actively venturing into the field of digital innovation. Prospectively, these nations exhibit a coordinated development pattern across digital foundations, applications, and innovation. This integrated approach signals an upcoming surge in digital infrastructure development and promises significant strides in technological innovation and model innovation in the digital economy.

In terms of digital finance, countries grouped into leading-coordination zone, scoring from 0.21 to 0.50 on the Digital Finance Development Index, are led by South Africa and Kenya with a significant edge in financial development. These nations have solidified their digital finance infrastructure and are replete with fintech firms offering financial services from lending to investment and insurance. The majority have spearheaded a mobile payment revolution, greatly improving financial accessibility. Countries like Egypt and Kenya also boast a multitude of fintech firms offering financial services from lending to investment, and insurance. With digital technology as a catalyst, those countries have evolved a sophisticated digital finance sector.

*Tips: Egypt's digital finance sector is poised for significant expansion. The government has prioritized its growth as an integral part of the national development strategy, rolling out a suite of incentives to foster this sector. Initiatives include the establishment of a fintech hub and the "Egypt Fintech" platform, which harnesses governmental resources to fortify the infrastructure for digital finance. Collaboratively, the National Telecommunications Regulatory Authority and telecom operators have introduced a range of digital financial products. Concurrently, major corporations and banks are enhancing their independent innovation and are also collaborating with entrepreneurs to exert a substantial impact in the digital finance ecosystem. In 2014, the digital finance sector in Egypt was nascent with just two firms. By 2021, this figure had exploded to 112, marking a 55-fold increase. Over the past five years alone, the volume of online financial transactions has increased nearly tenfold. The New Payments Index 2022 by Mastercard reveals that 88% of respondents in Egypt had adopted at least one new payment method in the last year. Electronic wallets were favored by 35%, mobile transfers by 27%, and QR code payments by 24%. Mastercard sees Egypt's expanding Internet access, a burgeoning youth demographic, prevalent smart phone adoption, the increasing popularity of online shopping, and government's robust support for inclusive finance as key drivers. Those dynamics are propelling the swift growth of electronic payments and unlocking vast potential for the digital finance sector in Egypt.*

In terms of digital consumption, South Africa and Egypt stand out as frontrunners in digital consumption among the countries grouped into leading-coordination zone, with a notable lead over their peers. The remaining countries within this group exhibit a more uniform development pattern. Collectively, they demonstrate a well-rounded advancement in Assurance Measures, Ability to Pay, and Ecosystem Support. These nations are endowed with sophisticated digital infrastructures, vibrant consumer markets, and a wealth of digital consumption offerings, thereby serving as leading countries for the overall digital consumption evolution in Africa.

In terms of digital economy across cities, key cities in countries grouped into leading-coordination zone command millions of smart phone users, with per capita Wi-Fi consumption

and 4G adoption rates that are regionally dominant, positioning them as leaders in Africa’s urban digital economy. In Nairobi, capital of Kenya, smart phones are in the hands of 60% of the population, indicating that smart phones are prevalent among more than half of the city’s population. The city also shows a pronounced preference for Wi-Fi over mobile data, underscoring its advanced digital infrastructure. Cape Town in South Africa stands out with Wi-Fi consumption that is four times the mobile data consumption, reflecting its digital vibrancy. Moreover, with a 4G coverage rate of 70.83%, Cape Town has established a robust network foundation for its ongoing digitalization.

***Tips:** Nairobi, capital of Kenya has emerged as a tech magnet, drawing tech firms across the globe. Crowned as Africa’s “smartest city” by the Intelligent Community Forum in 2015, its recognition is attributed to its high mobile adoption rates and its role as the base for regional headquarters of global tech titans such as Google, IBM, and Intel. The city also harbors a flourishing ecosystem of startups and innovation hubs. Nairobi is a vital link in the digital economic cooperation between China and Africa, with Kilimall—a prominent e-commerce platform founded by a Chinese entrepreneur—launched in the city. Kilimall is increasingly becoming a favored shopping destination among African consumers.*

## (2) Countries grouped into catch-up-coordination zone and their cities

Countries grouped into Catch-ups in the adjustment zone are represented by Nigeria, Ghana, Senegal, and Côte d’Ivoire. These nations have enacted policies and regulations or strategic plans to foster growth in this sector and have introduced regulations specifically for areas such as digital finance, e-governance, and blockchain applications, which are part of the new generation of communication technologies. Table 1-13 shows the recent digital economy policies in these nations.

**Table 1-13 Digital Economy Policies in Countries Grouped into Catch-up-Coordination Zone**

Country	Strategic planning	Main objective	Year of release
Nigeria	National Blockchain Policy	The policy envisions an economy energized by blockchain, facilitating secure transactions, seamless data sharing, and value exchanges among individuals, businesses, and government. This is designed to bolster innovation, trust, and prosperity across the board, and it represents a significant aspect of Nigeria’s strategic pivot to a digital economy.	2022
	Nigerian National Broadband Plan 2020 – 2025	The plan designates relevant telecommunications infrastructure as a critical national infrastructure.	2020
	National Digital Economy Policy and Strategy (2020-2030)	This strategy is crafted to pivot the Nigerian economy towards leveraging the vast opportunities within digital technology. It outlines essential actions for the ICT sector, building on its existing achievements while also identifying new focuses to drive Nigeria towards a robust digital economy.	2019

	Nigeria E-Government Masterplan	The plan has initiated the Nigeria Digital Governance Infrastructure Project (2020-2026), marking a significant step to bolster the country's digital economy.	2019
	National Data Strategy	The strategy revolves around seven key pillars essential for Nigeria's successful transition to a digital economy: data literacy and skills, data security and privacy, data sovereignty, and data infrastructure. It aims to harness data to stimulate the country's economic growth, innovation, and inclusiveness.	2023
Senegal	Digital Senegal 2025	The strategy outlines the legal and institutional framework, human resources, and digital trust as prerequisites for advancing the digital economy.	2016
	Electronic Communications Bill	The bill aims to reinforce the pivotal role of telecommunications, information and communications technology (ICT), and the digital economy in the country's development strategy by focusing on the legal and regulatory mechanisms of the digital economy.	2018
	Senegal Startup Act	The act establishes a specific management and support framework for such startups to foster a robust digital ecosystem.	2020
Côte d'Ivoire	Emerging Country Strategy 2020	The plan is to build upon solid, sustained, and comprehensive economic growth and employment to achieve a transformation of Côte d'Ivoire's economic structure towards industrialization. Investment and development will be intensified in six key areas, including infrastructure and medical insurance. In terms of the digital economy, the plan involves the expansion of the AZITO Power Project and the construction of the Soubré Hydropower Station, as well as the extension of the fiber optic network.	2012
	National Development Plan for 2016-2020	The plan prioritizes growth in energy, mining, agriculture, tourism, and handicrafts, and seeks to enhance the business climate to draw foreign investment, especially in digital and telecom sectors.	2016

In terms of the digital economy, countries grouped into catch-up-coordination zone are working to overcome their digital infrastructure deficits. Most have surpassed the average African coverage rates for ICT equipment and Internet access, but these nations still lag behind the leading countries in both the cost and quality of ICT services. A few nations, such as Zimbabwe, remain relatively underdeveloped in digital foundations. There is a wide disparity in digital application and innovation. Nations such as Nigeria and Ethiopia are actively leveraging digital technologies to transform social production and they boast relatively favorable environments for digital innovation. Prospectively, there is a collaborative development trend within the digital economy systems of these countries, with explorations in various fields effectively propelling the growth of the digital economy and promising more international cooperation opportunities in this sector.

In terms of digital finance, countries grouped into catch-up-coordination zone, score from 0.16 to 0.32 on the Digital Finance Development Index, revealing a considerable gap compared to those in the coordination zone. Nigeria has earned a higher digital finance ranking thanks to its progressive fintech applications. However, there's an imbalance in digital finance development among these nations. For example, Uganda and Côte d'Ivoire are somewhat advanced but are just on the cusp of the first tier, constrained by their underdeveloped traditional financial sectors. Senegal is in the second tier, as its traditional financial base does not fully underpin a digital shift.



**Tips:** Amidst the digital wave, Senegal's digital financial sector is experiencing swift growth. To address challenges such as the incomplete transition to 4G, high Internet costs, and a deficient talent development system, Senegal has introduced the "Electronic Communications Bill" and "Senegal Startup Act" to consolidate the strategic importance of ICT sector and digital economy. A "National Digital Economy Council", chaired by Prime Minister, has been set up to devise the national digital economy strategy. This effort includes the creation of a national data center and four national Tier-III data centers to manage state data and bolster data sovereignty. The country has also begun laying a national submarine cable to pursue an enhanced Internet access and lower costs. It has expanded fiber optic and mobile network coverage to 90% and is looking to adopt 5G technology. By the end of 2022, Senegal boasted five million Internet users and four million mobile payment users, according to the International Telecommunication Union and the Central Bank of West African States (BCEAO) respectively. This rapid digital adoption is creating new opportunities for the expansion of Senegal's digital financial market.

In terms of digital consumption, countries grouped into catch-up-coordination zone, Nigeria excepted, trail the leading countries notably in digital consumption, positioning them at a mid-level in Africa's digital economy landscape. They split into two groups: those with specific shortcomings that hinder their overall development; those with balanced yet insufficient indicator development compared to leading countries. Nigeria, for example, excels in Ability to Pay but is average in Assurance Measures. Meanwhile, Ghana, ranking 10th overall, has its Assurance Measures, Ability to Pay, and Ecosystem Support ranked 9th, 11th, and 10th, respectively. These rankings are closely aligned with its overall ranking but do not place it at the forefront, indicating a gap in comparison to leading countries.

**Tips:** Nigeria, Africa's largest economy and home to the continent's biggest e-commerce market, hosts the headquarters of over 40% of Africa's e-commerce companies. It has developed a highly influential e-commerce industry cluster, making it a top option for e-commerce start-ups. However, Nigeria has not fully leveraged its consumption edges. In terms of indicators for digital consumption evaluation, Nigeria ranks second in Ability to Pay, 13th in Assurance Measures, and 11th in Ecosystem Support. Data from Statista reveals that, by the end of 2021, Nigeria had 102 million mobile Internet users with a penetration rate of 48.12%, predominantly on 2G and 3G networks, and only 4% of mobile users had access to 4G. This suggests that the relatively weak digital infrastructure is partially hindering the development of digital consumption in Nigeria.

In terms of digital economy across cities, Lagos, the capital of Nigeria (one grouped into a catch-up-coordination zone) boasts the most vibrant start-up scene in Africa, representing 10.3% of the continent's total. These start-ups, operating in areas such as mobile applications, e-commerce, digital entertainment and software development, have injected new impetus into the digital economy. Residents can access social networks, communication and e-commerce services on mobile applications, supported by major mobile operators that offer citywide network services, including 3G, 4G, and the emerging 5G technology. In Dakar of Senegal, and Bamako of Mali, per capita Wi-Fi data consumption exceeds mobile data consumption, with

4G network adoption slightly surpassing that of 3G. Additionally, the smart phone penetration rate in Dakar has reached 63%, compared to 38% in Bamako. These cities exhibit a well-rounded development in various aspects of digital economy, demonstrating promising levels of development.

### (3) Countries grouped into catch-up-adjustment zone and their cities

Countries grouped into catch-up-adjustment zone, represented by Mali, Rwanda and Niger, are acutely aware of the pivotal role that digital economy plays in catalyzing their growth. Yet, the formulation of their strategies for developing digital economy varies markedly due to their distinct economic foundations. Countries like Mali, Lesotho, and Rwanda, which enjoy a more conducive economic climate, have been early adopters of digital initiatives. They have already charted and are enacting legal and policy frameworks to enhance the development environment for sectors such as digital payments and digital governance. In contrast, while governments of countries including Niger and Angola have prioritized digital economy in their strategic planning, their digital initiatives have proceeded at a sluggish pace, leaving numerous projects largely in the planning phase.

**Table 1-14 Digital Economy Policies in Countries Grouped into Catch-up-Adjustment Zone**

Country	Strategic planning	Main objective	Year of release
Rwanda	Vision 2050	The policy plan suggests that Government of Rwanda is committed to bolstering economic recovery by supporting businesses affected by the pandemic. Additionally, strategic investments in education, healthcare, ICT, and agriculture are set to be key priorities for the country moving forward.	2020
	Kigali Declaration	The declaration clarifies that ICT has become the foundation for every sector, and that universal, secure and affordable broadband access is indispensable in the digital era.	2022
Mali	Strategic Framework for Economic Recovery and Sustainable Development (CREDD 2019-2023)	The strategic plan aligns with the UN 2030 Agenda for Sustainable Development and the African Union's Agenda 2063, laying out detailed requirements for Mali's socio-economic development. It covers areas such as democratic governance, peace and security, transformation of economic structures, and environmental protection. The plan sets ambitious targets, including an annual GDP growth rate of 6.5%, an annual per capita GDP growth of 2.9%, and a reduction of the poverty rate to 39.2%.	2019
	Digital Mali 2020	The plan sets forth goals such as a 12% share of e-commerce in GDP, the enactment of four Internet-related laws, expansion to 500 enterprises with online payment adoption, the direct creation of 3,000 jobs and an indirect creation of 50,000 jobs, and a 4,500-km fiber optic network jointly built by China International Telecommunication Construction Corporation and Huawei.	2014

In terms of the digital economy, countries grouped into catch-up-adjustment zone are on par with those grouped into catch-up-coordination zone both actively improving digital infrastructure and focusing on the digital transformation of industries. Yet, these nations are experiencing a lack of coordination in the evolution of their digital economic systems, with a particularly evident decline in the orderly development of their digital innovation subsystems. This reflects an inadequacy in the support provided by their digital innovation capabilities for the advancement of their digital economies.

In terms of digital finance, countries grouped into catch-up-adjustment zone, despite having digital finance development levels similar to those grouped into catch-up-coordination zone, face a dual landscape of opportunities and challenges. While nations like Rwanda and Tanzania have seen substantial growth in digital finance, other countries in this group have weaker comprehensive capabilities. In this sense, a collaborative approach involving government, businesses, and the broader community is essential. This coordination should focus on constructing digital infrastructure, fostering fintech innovation, and accelerating the development of digital finance to achieve digital transformation.

***Tips:** Mali's financial services are predominantly concentrated in urban areas, where non-bank institutions such as post offices, retail stores, and phone booths serve as agents to provide essential banking services such as deposits, withdrawals, transfers, and bill payments. This approach helps to extend the reach of banking services to more people. The development of fintech in Mali is primarily driven by mobile payment solutions and banking agent services, which have improved financial inclusion to a certain degree. However, the World Bank's data indicates that in 2020, only 28.4% of adults in Mali had accounts with financial institutions, and a mere 34.0% of adults were using mobile payment services. Additionally, the use of financial software in Mali is significantly lower than the African average. The fintech sector in Mali remains small and has limited influence. To enhance financial inclusion and promote the development of digital finance, Mali needs to strengthen the innovation and promotion of fintech.*

Digital consumption, in terms of it, in countries grouped into catch-up-adjustment zone varies significantly. They can split into two types. One consists of countries with relatively underdeveloped digital infrastructure and weak payment capabilities for digital consumption, which impede the growth of digital consumption. Despite a significant demand for mobile applications such as gaming and social media, countries of this type lack the financial capacity to engage in these activities. Niger is a quintessential example. Despite lagging behind in various types of infrastructure across Africa, its adoption of various applications is comparable to other countries, indicating a demand for these applications. However, factors such as limited power supply slow Internet speeds, high costs, and inadequate devices hinder widespread adoption. The other consists of countries with well-established digital infrastructure and relatively strong payment capabilities for digital consumption compared to others, yet they are underdeveloped in terms of business models for digital consumption and remain in the exploratory phase, urgently seeking development paths that align with their strengths. Rwanda is a prime example of this type. It has relatively advanced digital infrastructure but ranks low in Africa for its Ecosystem Support, which to some extent restricts the development of its digital consumption.

In terms of digital economy across cities, the Government of Rwanda is advancing Kigali Innovation City to house top-tier universities, tech firms, biotech firms, and commercial and retail real estate developers. While most major African cities have seen 4G networks overtake 3G in usage, Kigali has a smart phone penetration rate of just 11%, with a preference for the 3G network, particularly as the 4G coverage stands at a mere 31.56%. Data from GSMA reveal

that Kigali has achieved 100% coverage <sup>1</sup> for both 3G and 4G networks. This discrepancy may stem from the high cost of traffic packages, which many people find unaffordable, thus limiting their access to and use of the Internet. Data from the National Institute of Statistics of Rwanda indicate that Rwanda has among the steepest Internet costs in Africa<sup>2</sup>. Furthermore, the World Information Society Report 2019 published by the International Telecommunication Union notes that Rwanda has lower levels of digital literacy and Internet proficiency, which may explain the disparity between high 4G availability and low user adoption in Kigali. In terms of Internet traffic consumption, Kigali's per capita Wi-Fi data consumption is approximately 13.18GB, indicating a clear gap compared to cities in countries grouped into catch-up countries and suggesting that the city is in the early phases of digital engagement.

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<sup>1</sup> Mobile Coverage Maps, [https://www.mobilecoveragemaps.com/map\\_rw#11/-1.9601/30.0086](https://www.mobilecoveragemaps.com/map_rw#11/-1.9601/30.0086).

<sup>2</sup> National Institute of Statistics of Rwanda, [www.statistics.gov.rw](http://www.statistics.gov.rw).

## Chapter II China-Africa Cooperation in Digital Economy

*Over the past 20 years, China-Africa relations have been further underpinned by political foundation, and bilateral cooperation has been deepened. The bilateral relations have leapfrogged from the “new type of partnership” to the “new type of strategic partnership” to the “comprehensive strategic cooperative partnership”, and then to “China-Africa community with a shared future”. As the digital economy constantly develops around the world, China and Africa place a high value on the opportunities for leapfrog development brought by the digital economy and continue to foster cooperation in the field of digital economy. After analyzing and summarizing the history of China-Africa digital economy cooperation, this section describes the current status and problems of cooperation between China and Africa in the fields of hardware support, software support, digital services, and digital technology, and selects representative cooperative enterprises for case study.*

### 2.1 Process of China-Africa cooperation in digital economy

In recent years, China-Africa cooperation has extended from traditional infrastructure and resource development to emerging areas such as the digital economy. The digital economy strategies of China and Africa have been closely aligned through platforms built by governments at all levels, and this has given a greater impetus to cooperation. The collaboration dates back to the end of the last century and it initially focused on building digital infrastructure to bridge the digital divide in Africa. In 2003, the *Forum on China-Africa Cooperation – Addis Ababa Action Plan* listed infrastructure construction as a cooperation priority and extended it to the fields of telecommunications and electric power. The Forums in 2006 and 2009 placed greater emphasis on building information infrastructure in an effort to advance Africa’s digital development. In particular, according to the 2009 Sharm el-Sheikh Action Plan, China pledged to foster cooperation with Africa in the field of information and communications technology, including personnel training, support for Chinese enterprises to participate in infrastructure construction, and launched the China-Africa Science and Technology Partnership Program to boost Africa’s scientific and technological capabilities.

On the basis of furthering China-Africa cooperation in the field of digital economy, the Fifth Ministerial Conference of the Forum on China-Africa Cooperation (FOCAC) held in 2012 put forward a framework for in-depth cooperation, emphasizing cooperation in infrastructure and high-tech industries. The Beijing Action Plan adopted at this meeting further detailed cooperation with the ICT, radio and television sectors of African countries, including personnel training and the participation of Chinese enterprises in the construction of information infrastructure in Africa. In 2015, the Chinese government issued *China's Africa Policy Paper*, advocating for expanding the participation of enterprises and financial institutions in Africa and promoting infrastructure and industrial development. Moreover, the *Action Plan of the Johannesburg Summit of the Forum on China-Africa Cooperation (2016-2018)* and the *Beijing Action Plan of the Forum on China-Africa Cooperation (2019-2021)* both emphasize ICT

cooperation and support for the establishment of e-commerce mechanism to bridge the digital divide and promote the emergence of an information society in Africa. In 2020, the *Cooperation Plan on Jointly Promoting the Silk Road Economic Belt and the 21st Century Maritime Silk Road between the Government of the PRC and the African Union* was officially signed, which, as the first cooperation planning document signed between China and the African Union, aims to effectively align the Belt and Road Initiative with the African Union's *Agenda 2063*. This document lists telecommunications, e-commerce and industrial sector, agriculture, new infrastructure, green energy, finance and other fields as priority areas of cooperation.

As global digital technology is continuously innovated and the digital elements are increasingly integrated with social production systems, more opportunities for international cooperation have emerged in the field of digital economy, and China-Africa cooperation in the field of digital economy has also become closer. In 2020, President Xi Jinping proposed at the Extraordinary China-Africa Summit on Solidarity against COVID-19 to scale up cooperation in emerging businesses such as digital economy, smart city, and 5G. On a visit to Africa in 2021, State Councilor Wang Yi proposed the "Digital Africa" initiative. At the China-Africa Internet Development and Cooperation Forum held in August of the same year, China proposed the China-Africa Digital Innovation Partnership Program, which includes six areas – digital infrastructure, digital economy, digital education, digital inclusion, digital security, and digital cooperation platform. According to the Dakar Declaration of the Forum on China-Africa Cooperation adopted in the same year, China announced assistance to Africa in implementing 10 digital economy projects, including the construction of a remote sensing application cooperation center and a scientific and technological innovation cooperation base. At the same time, the two sides jointly fostered cooperation in "Silk Road e-commerce", drew up China-Africa plan for inclusive development of e-commerce, held the African quality commodity online shopping festival and tourism e-commerce promotion activities, and implemented the "platform access for 100 stores and 1,000 products" program for Africa. *The Forum on China-Africa Cooperation (FOCAC) – Dakar Action Plan (2022-2024)* emphasizes that the two sides will prepare and implement the China-Africa Digital Innovation Partnership Program, and discuss and promote cooperation in the application of new technologies such as cloud computing, big data, artificial intelligence, Internet of Things and mobile Internet; foster cooperation in international organizations such as the ITU and the World Radiocommunication Conferences, and promote collaboration in personnel training, network connectivity, innovation center construction, among others. In October 2023, the High-level Digital Economy Forum of the Third Belt and Road Forum for International Cooperation announced eight initiatives and put forward ardent expectations for the building of the Digital Silk Road. This highlights the importance of the digital economy to the development of industries worldwide, promotes China-Africa cooperation in the building of the Digital Silk Road, and discusses the future of high-quality Belt and Road cooperation. The China-Africa Internet Development and Cooperation Forum held in April 2024 promoted in-depth exchanges of views on AI cooperation, calling for increasing policy dialogue, promoting technology R&D and application, advancing industrial cooperation and development, conducting personnel exchange and capacity building, and building a security shield for network and data. This further fosters China-Africa cooperation in the digital economy.

In recent years, China-Africa cooperation in the digital economy has become closer in scope, level and depth, which is a new driving force for China-Africa cooperation and gives a new impetus to the development of China and Africa. In terms of scope, China-Africa cooperation in digital economy has gradually transitioned from basic information infrastructure construction to deep integration in the fields of high technology and innovation. The implementation of these projects and mechanisms has effectively promoted the improvement of Africa's scientific and technological capabilities as well as the establishment of a digital economy system, and also reflects the progress of China-Africa cooperation from infrastructure to the field of high technology and innovation. In terms of depth, China and Africa jointly promote the implementation of ICT talent cultivation, technology R&D, and digital economy projects through major action plans such as the *Forum on China-Africa Cooperation – Beijing Action Plan (2019-2021)*. As digital technology advances by leaps and bounds, the two sides have increasingly enhanced cooperation in the fields of cloud computing, big data, artificial intelligence and the Internet of Things, and have also collaborated through international organizations to promote the construction of technology application and innovation centers. These digital economy cooperation strategies demonstrate that China and Africa will cooperate in the field of digital economy, working together to bridge the digital divide in Africa and promoting the building of information society in Africa. It will promote the China-Africa comprehensive strategic cooperative partnership to a new height.

Going forward, China-Africa cooperation in digital economy is expected to be deepened. As rapid progress and innovations are made in the digital economy, China and Africa will strengthen cooperation and jointly investigate the application of digital technology in economic development, social progress and long-term development. The two sides can further strengthen personnel training and exchanges, advance the diffusion and application of digital technology, build a partnership in the digital era, and foster China-Africa cooperation for common prosperity and sustainable development.

## **2.2 The practical foundation for China-Africa cooperation in the digital economy**

### **2.2.1 China has rich experience in the development of the digital economy**

In 2022, China's digital economy reached 50.2 trillion yuan, ranking second in the world, with a nominal growth of 10.3% year-on-year, and its proportion in GDP reached 41.5%. In terms of digital infrastructure, China's network and application service capabilities have been rapidly enhanced, which facilitates coordinated development. China has built the world's largest optical fiber and 4G network infrastructure, and its fixed broadband household adoption rate increased from 52.6% in 2015 to 96% in 2020, and mobile broadband adoption rate increased from 57.4% to 108% in the same period. Furthermore, China leads the world in terms of the construction of 5G network and user coverage. By the end of 2022, China had opened 2.312 million 5G base stations, with over 561 million 5G service users, accounting for over 60% of the world's total users. In addition, more than 110 cities meet the Gigabit City construction standard, covering over 500 million households.

In the field of digital applications, in 2022, China's digital industry steadily expanded, and digital technology was further integrated with the real economy and government affairs, spawning many new business models and forms. According to the *Digital China Development Report (2022)*, the operating income of the electronic information manufacturing industry was 15.4 trillion yuan, up by 5.5% year on year. The revenue of the software industry exceeded 10 trillion yuan for the first time, reaching 10.81 trillion yuan, up by 11.2% year-on-year. The revenue of the information technology service industry was 7,012.8 billion yuan, up by 11.7% year-on-year, of which the revenue from cloud computing and big data services was 1,042.7 billion yuan, accounting for 14.9% of the industry's total revenue. The revenue from integrated circuit design reached 279.7 billion yuan, up by 12.0%. The revenue from e-commerce related technical services was 1,104.4 billion yuan, up by 18.5%. The revenue from telecommunications business reached 1.58 trillion yuan, up by 7.5%. In terms of digital government service, China's e-government development index progressed from the 78th in 2012 to 43rd in 2022, and there are more than one billion real-name registered users, who used the platform over 85 billion times. This has significantly improved the efficiency of government services.

In the field of digital innovation, China has made great strides in the research and development of basic and general-purpose technologies. According to the World Intellectual Property Organization's Global Innovation Index, China's ranking jumped from 29th in 2015 to 11th in 2022. China ranks first in the world in many fields, including patent applications, utility models, industrial designs and trademark registrations. China has outstanding performance in the innovation and application of 5G technology, and has also shown positive results in R&D of key digital technologies, including 6G. Important progress has been made in many technical fields such as integrated circuits, artificial intelligence, high-performance computing and electronic design automation. China has 162 of the world's top 500 supercomputers, ranking among the best in the world. Furthermore, the *Annual Report of Global Digital Talent Development (2022)* shows that China leads the world in the proportion of digital talent in the ICT and related manufacturing and consumer goods industries, and boasts a good foundation and competitive edge in the field of digital economy.

China's digital economy presents a trend of world-leading development, and its development path can be summarized as "infrastructure construction first, emergence of application innovations, and technological innovation-driven development". In the early stage of development, China focused on building and improving network and application infrastructure, which offer a good foundation for the booming digital economy. As the infrastructure matures, China's digital economy has steadily expanded the industrial scale through its deep integration with the real economy and government affairs, and has consistently nurtured and promoted new business forms of digital application, and effectively spurred economic transition and upgrading. In terms of technological innovation, China's emphasis on the R&D of basic and general-purpose technologies has significantly enhanced China's ranking in the Global Innovation Index, making innovation activities a core driving force for the digital economy. The three stages of development – strong infrastructure support, innovative expansion of application fields, and innovation-driven technological advance – have contributed to China's global leadership in the digital economy, offering a broad vision for its future development.



## 2.2.2 Africa has the basis and conditions for the development of the digital economy

In terms of policy support, the African Union (AU) and its member states put a high value on the development of the digital economy by implementing a series of supporting policies. At the regional level, the AU's Agenda 2063 sets out a comprehensive development strategy that encompasses ICTs and the digital economy, with a view to turning Africa into a unified digital economy. In 2020, the AU released the *Digital Transformation Strategy for Africa (2020-2030)*, which promotes the digitalization of infrastructure and key industries on the basis of existing Policy and Regulation Initiative for Digital Africa (PRIDA) and the Programme for Infrastructure Development in Africa (PIDA). It aims to promote economic and social development through digital technology innovations, narrow the digital divide, and foster Africa's integrated and inclusive growth. National-level policy support is also being increased, which covers areas such as mobile payment, fintech, digital agriculture and e-commerce. For example, Kenya invested US\$9.4 billion in 2019 to build a 5,000-acre technology innovation city, and in February 2022, its central bank released the *Discussion Paper on Central Bank Digital Currency*. Nigeria prepared a broadband development plan for 2020-2025 to improve broadband coverage and internet access speed in urban and rural areas, and launched a central bank digital currency "eNaira" in October 2021, becoming the first country in Africa to adopt a digital currency. Ethiopia slashed internet fees and tripled broadband speed in 2020. In terms of regulation of the digital economy, African countries have improved the regulatory environment. For example, Kenya's personal data protection law and Nigeria's law against the spread of false information on social media platforms have improved the security and credibility of the digital space. According to Global Communications Alliance's data, in 2020, 52% of African countries were classified as "G3", while countries such as Senegal and Rwanda meet the standards for "G4" or even closer to "G5"<sup>1</sup>.

In terms of market environment, Africa's digital economy market promises tremendous potential. First of all, Africa's rapid urbanization offers a broad market for digital services. As of 2020, there were more than 68 cities with a population of at least one million. This number is expected to increase to 85 by 2025. Countries such as Nigeria, Ghana and Angola will account for over 80% of the total population by 2050, providing a large user base for digital networks<sup>2</sup>. Second, Africa's young population provides a huge demographic dividend for the building of "Digital Africa". Africa's young population and increasing educational attainment are important assets for accelerating Africa's digital transformation, providing strong human resources support for the development of the digital economy. By 2025, approximately 60% of Africa's population will be less than 24 years old. By 2050, Africa will account for one-third of the world's young population aged 15 to 35 years. Third, African regional integration has promoted trade facilitation and the cross-border development of the digital economy through the establishment of the African Continental Free Trade Area (AfCFTA). In addition to reducing tariffs and trade barriers between member states, the FTA has taken measures such as the Digital Trade Protocol to promote the establishment of digital authentication and electronic trust

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1 ICT, "Global ICT Regulatory Outlook Series", <https://www.itu.int/en/ITU-D/Regulatory-Market/Pages/giro20.aspx>

2 IFC, "e-Conomy Africa 2020 : Africa's One Hundred and Eighty Billion Dollars Internet Economy Future", <https://documents1.worldbank.org/curated/en/490801613545693757/pdf/Main-Report.pdf>

mechanisms, and accelerated the widespread use of digital technology. These factors indicate that Africa will become one of the world's most attractive markets for the digital economy. Finally, African regional integration is contributing to trade facilitation. According to the AU's Agenda 2063, a secure digital single market will be established in Africa by 2030 to ensure the free flow of personnel, services and capital, allowing individuals and businesses to seamlessly access and participate in the AfCFTA's online activities. The AfCFTA, a core part of the Agenda 2063, was established in 2019 and has been operating since 2021, dedicated to promoting economic and regional integration in Africa. On the one hand, by improving border infrastructure, reducing the cost of administrative procedures, and so on, the AfCFTA has markedly reduced tariffs and trade barriers between member states, increased the cross-border flow of knowledge and technology, and spurred the wide dissemination and application of digital technology, thereby accelerating the development of the digital economy as a whole. On the other hand, as negotiations on the Digital Trade Protocol advance, the AfCFTA is working to eliminate tariffs on cross-border digital trade, implementing a unified electronic authentication and trust mechanism, protecting source code, etc., with a view to increasing intra-African digital trade. The improvement of the AfCFTA not only supports the economic recovery of African countries, but provides a strong market basis for the growth of the digital economy as well. In the long run, Africa's continuous urbanization, young population, and regional integration indicate its potential to become one of the world's most attractive markets for digital economy.

## **2.3 The current status of China-Africa cooperation in the digital economy**

### **2.3.1 Digital foundation**

In terms of digital infrastructure, notable achievements have been made in China-Africa cooperation. China uses its rich experience in ICT construction to promote its strategic alignment with Africa's "Digital Silk Road", particularly increasing cooperation in infrastructure construction projects. First of all, China has been involved in a number of submarine cable projects linking Africa with Europe, Asia and the Americas. Specifically, under China's "Digital Silk Road" initiative launched in 2016, China's PEACE submarine cable project, which has a total cable length of 12,000 kilometers, connects China, Eurasia and East Africa, covering many countries extending from Pakistan to South Africa. It provides the world's fastest cable network speed services, significantly improving Africa's digital communication infrastructure.<sup>1</sup> On May 14, 2020, China Mobile International Ltd., Facebook, South African telecom operator MTN GlobalConnect, and six other global institutions from around the world announced the joint laying of the "2Africa" submarine cables, with a total length of 37,000 kilometers. The cable covers 21 landing points in 16 African countries, and is

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<sup>1</sup> Larçon, J.-P. & Vadcar, C, "Economic Opportunities and Challenges of the New Silk Road", [https://www.researchgate.net/publication/340675438\\_Larcon\\_JP\\_Vadcar\\_C\\_2019\\_xinsichouzhilu\\_jingjijiyu\\_yujingjitiaozhanLes\\_Nouvelles\\_Routes\\_de\\_la\\_Soie\\_CCI\\_PIdF](https://www.researchgate.net/publication/340675438_Larcon_JP_Vadcar_C_2019_xinsichouzhilu_jingjijiyu_yujingjitiaozhanLes_Nouvelles_Routes_de_la_Soie_CCI_PIdF), 2021-12-15.

expected to be one of the largest submarine cables in the world.<sup>1</sup> Since August 2022, Chinese companies have supported the installation and upgrading of approximately 150,000 kilometers of communication backbone networks in Africa, which greatly expanded the network services to cover approximately 700 million users. Moreover, for the first time, high-speed internet access covers the rest campsite of Kilimanjaro and its highest peak.<sup>2</sup>

Second, Chinese operators have collaborated with Africa's major telecom operators to achieve full coverage of telecom services, and have built more than half of the wireless communication base stations and high-speed mobile broadband networks in Africa. At present, over 200,000 kilometers of fiber optic networks have been built in Africa to serve more than 900 million people.<sup>3</sup> As of 2020, China Telecom had not only installed optical fiber backbone networks in ten African countries, but also set up technical support teams in nearly 30 African countries, and implemented projects such as smart cities and industrial parks in Algeria, Djibouti, South Africa and other countries.<sup>4</sup> In terms of data center construction, although Africa accounts for 17% of the world's population, Africa's data center capacity is extremely low, accounting for less than 1% of the world's total. Investment in data centers in Africa has burgeoned since 2020 and is expected to soar from US\$420 million in 2020 to approximately US\$5 billion by 2026, with a Compound Annual Growth Rate (CAGR) of 15%.<sup>5</sup> Moreover, Huawei is active in this field, responsible for building data centers in several African countries, including the national data center delivered to Malawi in July 2022. Huawei also cooperated with Zambia's MTN to pilot a 5G network program in 2022, and as a result, Zambia became one of the first African countries to have 5G services.<sup>6</sup> In the same year, Huawei conducted pre-test of 5G services in Addis Ababa, Ethiopia, to improve the living standards of the local people.<sup>7</sup>

In order to deepen China-Africa cooperation in supporting infrastructure for the digital economy, there are still problems such as slow infrastructure construction and lack of sustained development. First of all, Africa's traditional infrastructure, especially power supply, is woefully inadequate, with about half of African countries plagued by unstable power supply and prices triple that of the Asian region.<sup>8</sup> Moreover, network coverage and service quality leave a lot to be desired. The 3G network is still the mainstream mobile communication technology, and more than half of the residents still rely on the 2G network for communication. According to an International Telecommunication Union report, Africa's average score on the network performance index is 15.46, far below the global average, which is a significant hurdle to the application of advanced technologies such as 4G. The Digital Transformation Strategy

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1 "Nine Institutions Jointly Build 2Africa Submarine Cable to Upgrade Africa's Digital Infrastructure", Ministry of Commerce of the People's Republic of China, <http://gn.mofcom.gov.cn/article/jmxw/202005/20200502966006.shtml>.

2 "New Progress in China-Africa Belt and Road Cooperation", Xinhua News Agency, [https://www.gov.cn/xinwen/2022-08/20/content\\_5706123.htm](https://www.gov.cn/xinwen/2022-08/20/content_5706123.htm), Aug. 20, 2022.

3 China and Africa in the New Era: A Partnership of Equals, Information Office of the State Council of the People's Republic of China, [http://www.cidca.gov.cn/2021-11/26/c\\_1211463152.htm](http://www.cidca.gov.cn/2021-11/26/c_1211463152.htm), Nov. 26, 2021.

4 "Helping 'Smart Africa' Build 'Information Silk Road'", chinadaily.com.cn, <https://cn.chinadaily.com.cn/a/201906/29/WS5d174be6a3108375f8f2d35b.html>, Jun. 29, 2019.

5 Africa Data Centres Association & Xalam Analytics, "GROWING AFRICA'S DATA CENTER ECOSYSTEM: AN ASSESSMENT OF UTILITY REQUIREMENTS", <http://africadca.org/wp-content/uploads/2022/09/ADCA-Xalam-White-Paper-Africa-Utilities-Requirements-Final.pdf?success=1686452484>.

6 "Huawei Helps Zambia Embrace the 5G Era", Xinhua News Agency, [http://www.news.cn/2022-01/12/c\\_1128254027.htm](http://www.news.cn/2022-01/12/c_1128254027.htm), Jan. 12, 2022.

7 "Ethiopia Launches Pilot 5G Network Service", Xinhua News Agency, [http://www.news.cn/world/2022-05/11/c\\_1128638444.htm](http://www.news.cn/world/2022-05/11/c_1128638444.htm), May 11, 2022.

8 The Economist, "More Than Half of Sub-Saharan Africans Lack Access to Electricity", <https://www.economist.com/graphic-detail/2019/11/13/more-than-half-of-sub-saharan-africans-lack-access-to-electricity>, Dec. 15, 2021.

for Africa also shows that nearly 300 million people live over 50 kilometers away from the nearest fiber optic network or broadband access point. Infrastructure in these areas is poorly equipped and managed and can hardly meet the needs of the digital economy. Second, in terms of digital infrastructure, challenges facing Africa include high construction costs, acute funding shortage, and complex construction environment. According to international classification standards, network construction can be roughly divided into three parts: the “first mile” (international access points), the “middle mile” (national backbone network and its key facilities such as data centers), and the “last mile” (local access network). “Last-mile” access is particularly difficult for Africa, and both technical and financial barriers must be removed. <sup>1</sup> Moreover, Africa’s submarine fiber optic cable connections are of poor quality and intercontinental and transnational fiber optic networks are inadequate, resulting in uneven development of communication networks among regions. To realize the goal of universal broadband access in Africa by 2030, it is estimated that at least additional 250,000 kilometers of fiber cables will be laid and the cost is estimated at US\$100 billion. <sup>2</sup> These data underscore the urgent needs and challenges of Africa’s digital infrastructure construction, presenting greater requirements as well as opportunities for China-Africa cooperation.

### 2.3.2 Digital application

In terms of digital applications, digital services including digital finance and e-commerce have developed at a fast clip. According to the data compiled by the China-Africa Development Fund, as of 2022, fintech and e-commerce are the most active and representative sectors in the field of venture capital investment in Africa, with a high level of participation by Chinese venture capital enterprises (Table 2-1, Table 2-2).

**Table 2-1 Participation of some Chinese-funded venture capital enterprises and investment institutions in Africa**

Startups	Size of latest financing	Number of round	Participation of investment institutions with Chinese background	Time of announcement of financing	Remarks
Boomplay	US\$20 million	Series A	Seas Capital, Maison Capital	March 2019	Music streaming media
PalmPay	US\$100 million	Series A	Seas Capital, Trustbridge Capital, MediaTek, etc.	August 2021	Mobile payment
Opay	US\$400 million	Series C	HongShan China, Source Code Capital, Meituan, etc.	August 2021	Kunlun’s African mobile payment company. It is valued at US\$2 billion in this round.
Scooper	--	Series A	UNITY VENTURES	May 2022	African version of Jinri Toutiao
MFS AFRICA	US\$100 million	Series C+	LUN Partners Group	June 2022	An African cross-border payment company. LUN

<sup>1</sup> Hamilton Research, “Africa: Africa’s Operational Fibre Optic Network Reaches 1 Million Route Kilometres”, <http://www.africabandwidthmaps.com/?p=6158>, Dec. 15, 2021.

<sup>2</sup> UNESCO, “National Learning Platforms and Tools”, United Nations Educational, Scientific and Cultural Organization”, <http://en.unesco.org/covid19/educationresponse/nationalresponses>, Dec. 15, 2021.

					Partners Group is an important investor in MFS AFRICA, having participated in the Series C investment and established MFS AFRICA ASIA, which focuses on China-Africa trade scene, with MFS AFRICA.
Phoenix	US\$100 million	Series A	Tencent, Transsion, Welight Capital, etc.	August 2022	Phoenix Browser

**Table 2-2 Other Chinese entrepreneur projects with small-scale financing and early rounds of investment**

Business type	Company	Business model	Round	Size of financing
E-commerce	Kilimall	E-commerce platform	Series A	Financing in progress
E-commerce	Amanbo	E-commerce solution	Series A	Financing in progress
Smart agriculture	Sunagri	Agricultural drone manipulator company	Angel round	Financing in progress (US\$1 million)
Internet access	Ahadi	Provide inclusive network access	Series A	Financing in progress (US\$5 million)

In the field of digital finance, a number of Chinese fintech companies have entered the African market in recent years. For example, in November 2015, Tencent launched “WeChat Wallet” in South Africa. In 2016, Standard Bank of South Africa integrated WeChat services to enable users to perform operations such as money transfer and payment. In August 2017, Ant Financial announced that its Alipay service had covered 10,000 merchants in South Africa. In the same year, Huawei signed a cooperation agreement with a cross-border remittance platform to provide international money transfer services for Huawei mobile phone users in Africa. In 2020, Alipay partnered with Vodacom, the South African subsidiary of African mobile operator Vodafone, to launch “VodaPay”, the African version of Alipay. The service, which has been officially launched in Nigeria, primarily provides mobile payment services. These digital payment cooperation initiatives have significantly promoted the development of China-Africa e-commerce platforms.<sup>1</sup> In October 2023, PalmPay, a leading African fintech company, officially launched OceanBase, a domestically developed database, which marks technological self-reliance and also significantly improves the efficiency and security of transaction processing.<sup>2</sup>

As a result of active efforts by China and Africa, coupled with China’s global leading position in cross-border e-commerce and Africa’s improving infrastructure,<sup>3</sup> Nigeria, Kenya, Rwanda

1 “Chinese and African Enterprises Strengthen Cooperation in Mobile Payment”, people.com.cn, <http://world.people.com.cn/n1/2021/1116/c1002-32283031.html>, Nov. 16, 2021.

2 “African ‘Alipay’ PalmPay Equipped with OceanBase: Cost Reduction by 80%”, OceanBase, <https://open.oceanbase.com/blog/7106406960>, Oct. 31, 2023.

3 Huang Meibo and Duan Qiuyun, “China-Africa E-commerce Cooperation in the Context of the Digital Silk Road”, West Asia and Africa, No. 1, 2020.

and other countries have jointly established cooperative e-commerce platforms with China. In South Africa, Nigeria, Kenya, Ghana, Uganda and other countries, 47% of commodities for cross-border e-commerce purchases come from China.<sup>1</sup> Founded in 2014, China's e-commerce platform Kilimall uses Internet technology to integrate e-commerce, payment, logistics, warehousing, customer service and marketing services, forming a comprehensive bilateral economic and trade channel. It maintains a leading position in the African market.<sup>2</sup> In 2018, Alibaba and the Rwandan government jointly announced the establishment of Africa's first trade platform "Afnea" under the framework of the Electronic World Trade Platform (eWTP).<sup>3</sup> Following the outbreak of the COVID-19 epidemic in 2020, the "Afnea" platform expanded its trade scale in the East African market and became the Yiwu commodity wholesaling center in East Africa. The example of 3,000 bags of coffee being snapped up illustrates its influence. Moreover, the African High-quality Commodity Shopping Festival co-organized by China and Africa in 2022 under the "Silk Road E-commerce" cooperation produced successful results. The "platform access for 100 stores and 1,000 products" program for Africa further promoted the integration and development of e-commerce and mobile payment.<sup>4</sup> The China-Africa Economic and Trade Expo (CAETE), which has been serving as a new cooperation platform since 2019, makes it easy for African customers to purchase Chinese products, and also helps African specialty goods to enter the Chinese market and promotes investment and financing cooperation among Chinese and African enterprises. The 2nd CAETE set up an exhibition area for African brand products and the trade process was simplified through the "online trading" platform. During the pandemic period, new business forms such as online promotion conferences, digital cooperation platforms, and live commerce mushroomed, which provided effective services for Chinese and African enterprises and promoted the export of African products to China.

Digital security issues emerge as the digital economy develops. According to the *2020 Safety Risk Exposure Index*, Africa has the largest number of high-risk exposure countries among the 108 countries on the list, with an average exposure index of 0.64 (index range 0-1), accounting for 36.7% of all high-risk countries, which indicates a high-risk status of the region.<sup>5</sup> Despite the fact that the Economic Community of West African States (ECOWAS) and the West African Economic and Monetary Union have begun to implement data protection legislation at the regional level, the standards for personal data protection in the laws vary widely, and these differences make it impossible to fully address the issue of digital security within the region. At the national level, while 28 countries in Africa have enacted personal data protection laws, only 11 have adopted laws to combat cybercrime, indicating that most countries do not have comprehensive legal safeguards for digital services.<sup>6</sup>

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1 "E-commerce Development in Africa", cross-border e-commerce platform, <https://www.52by.com/article/59531>, Jul. 9, 2021.

2 "New Opportunities and Future under the Epidemic – An Interview with China-Africa E-commerce Platform Kilimall", Forum on China-Africa Cooperation website: [http://www.focac.org/chn/zfgx/jmh/z/202111/t20211108\\_10445655.htm](http://www.focac.org/chn/zfgx/jmh/z/202111/t20211108_10445655.htm), Nov. 8, 2021.

3 "Alibaba's Electronic World Trade Platform (eWTP) Established in Africa", people.com.cn, <http://world.people.com.cn/n1/2018/1102/c1002-30377278.html>, Nov. 2, 2018.

4 "Online Shopping Helps More African Goods Enter the Chinese Market", Xinhua News Agency, [https://www.gov.cn/xinwen/2022-08/18/content\\_5705950.htm](https://www.gov.cn/xinwen/2022-08/18/content_5705950.htm), Aug. 18, 2022.

5 Password Managers, "Cybersecurity Exposure Index", <https://passwordmanagers.co/cybersecurity-exposure-index/#global>, Dec. 18, 2021.

6 Xia Fuwei, "Research on Digital Silk Road and China-Africa Digital Economy Cooperation", Beijing Foreign Studies University master's thesis, 2021.

### 2.3.3 Digital innovation

In terms of digital innovation, the bilateral cooperation is being deepened. The embedding of digital technology and its integration with the industrial innovation process are the basic features of digital innovation.<sup>1</sup> The innovative iteration and in-depth application of digital technology are the prerequisites for the occurrence of digital innovation. In this field, Africa-Africa cooperation is primarily manifested in the field of emerging technologies and the exchange and training of digital technology personnel.

Huawei and ZTE, China's leading communications equipment companies, have actively participated in the "mobile revolution" in modern Africa, becoming the most influential Chinese telecom manufacturers in Africa. Since entering the African market in 1998, Huawei has assisted local operators in accelerating ICT construction by providing solutions that optimize costs, shorten the investment payback period, and improve station efficiency. In addition, local data centers set up by Huawei in South Africa provide low-latency, secure, and reliable cloud services, and have launched the Africa Partner Program to build digital platforms in cooperation with a number of companies. As China's second largest telecom equipment manufacturer after Huawei, ZTE entered the African market in 1997 and has now established comprehensive strategic partnerships with operators in many African countries to provide a full range of solutions including wireless network, core network, and transmission technologies, and has inked contracts with a number of operators in 5G installation and application promotion to facilitate the digitalization of African industries.

China and Africa have also carried out extensive cooperation in emerging fields such as artificial intelligence and digital aviation. For example, Chinese enterprises have cooperated with Egypt, Algeria and other countries to promote the construction of the China-Africa Cooperation Center on Satellite Remote Sensing Application, and have held a number of relevant forums and conferences. Furthermore, China's AI-enabled surveillance technology has been utilized in several African countries, such as Cloudwalk's facial recognition technology at Zimbabwe's airports and transportation hubs.<sup>2</sup>

In terms of the cultivation and exchange of digital personnel, China and Africa are fostering cooperation in localized business strategies and personnel cooperation projects. On the one hand, Chinese companies such as Huawei nurture local digital technology personnel through the Huawei ICT Academy and "Seeds for the Future" program in Kenya and Egypt.<sup>3</sup> Huawei also works with educational institutions in South Africa to build ICT academies across the country,<sup>4</sup> while Alibaba provides e-commerce training for different populations in Rwanda and cooperates with local universities to offer e-commerce courses. On the other hand, China-Africa cooperation in the field of digital personnel training has been promoted, and a number of educational and technological exchange platforms have been established. In 2019, the China-

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1 Yu Jiang, Meng Qingshi, et al., "Digital Innovation: Exploration of New Perspectives in Innovation Research and its Inspiration", *Studies in Science of Science*, No. 7, 2017.

2 Abdi Latif Dahir, "Chinese Firms are Driving the Rise of AI Surveillance Across Africa", <https://qz.com/africa/1711109/china-s-huawei-is-driving-ai-surveillance-tools-in-africa>, Dec. 18, 2021.

3 Huawei Investment Holding Co., Ltd.: Huawei Investment Holding Co., Ltd.'s Sustainability Report of 2018, [https://ungc-production.s3.us-west-2.amazonaws.com/attachments/cop\\_2019/476851/original/csr-reprot-2018-cn.pdf?1563778541](https://ungc-production.s3.us-west-2.amazonaws.com/attachments/cop_2019/476851/original/csr-reprot-2018-cn.pdf?1563778541), Oct. 18, 2018.

4 "Africa's "Free Ride" for the Digital Economy, Here are Opportunity for China", *News on Africa*, <https://rmh.pdnews.cn/Pc/ArtInfoApi/article?id=24166561>, Oct. 19, 2021.

Africa Venture Capital Forum facilitated interaction between African entrepreneurs and China's top technology companies. In the same year, educational institutions such as Hangzhou Normal University's Alibaba Business School began to offer courses designed for African students, such as undergraduate cross-border e-commerce courses.<sup>1</sup> Moreover, in 2022, China and the Angolan government signed a memorandum of understanding on the "digital personnel" training program, with the aim of training over 10,000 Angolan young people in the next five years.<sup>2</sup> In September of the same year, China Merchants Group cooperated with the Djibouti government to operate a training camp on "Digital Innovation and Cross-border E-commerce", further strengthening the personnel training and cooperation between the two sides in the field of e-commerce.<sup>3</sup> In March 2023, Huawei launched the "DigiTruck" project in Uganda, a mobile digital classroom that provides high-quality digital skills training for residents in remote areas as instant technology education.<sup>4</sup> On January 12, 2024, the opening ceremony of the Angola Vocational Skills Training Center built with China's aid was held in Huambo City. The center specializes in improving the vocational skills of local residents and promoting employment and social & economic development.<sup>5</sup>

In recent years, China-Africa cooperation in the digital economy has faced significantly intensifying international competition. As China promotes the "5G" network and the "Digital Silk Road" in Africa, Western countries frequently use tactics such as "digital Leninism"<sup>6</sup> to suppress China-Africa cooperation, intensifying competition between China and the West in Africa's digital economy. On the one hand, in the field of digital infrastructure, for example, the U.S. "Indo-Pacific Strategy" advocates the establishment of Digital Connectivity and Cybersecurity Partnership, in order to restrict and suppress Huawei's 5G technology on a global scale.<sup>7</sup> In 2021, African telecom operators, including Kenya's Safaricom, curtailed their cooperation with Huawei because of political pressure from the West. U.S.-funded operators won bids for 5G licenses, further squeezing out Chinese companies such as Huawei and ZTE. Furthermore, large African telecom companies, influenced by funding from Western countries, are pressing for diversified suppliers and adopting Western technologies, such as South African telecom company's cooperation with Ericsson, and Togocom's cooperation with Nokia. At the same time, emerging markets such as those in East Asia, South Asia, and Latin America are also increasing their investment in digitalization in Africa, intensifying competitive pressure on China-Africa cooperation in digital technology. On the other hand, China competes with the Western countries led by the United States over digital sovereignty and digital rules. As the digital economy develops, China, the United States, and the European Union are all striving to occupy a favorable position in Africa's digital policy and governance. The European Union and

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1 "Alibaba Business School's First African Cross-border E-commerce Undergraduate Class Recruits Students in Rwanda", Xinhua News Agency, [http://m.xinhuanet.com/2019-04/12/c\\_1124360488.htm](http://m.xinhuanet.com/2019-04/12/c_1124360488.htm), Apr. 12, 2019.

2 "Working Together for Brilliant China-Africa Common Development", Xinhua News Agency, [https://www.gov.cn/yaowen/liebiao/202403/content\\_6939756.htm](https://www.gov.cn/yaowen/liebiao/202403/content_6939756.htm), Mar. 16, 2024.

3 "Opening Ceremony of the First Training Camp of China-Djibouti African Youth Innovation and Entrepreneurship Center, Xinhua News Agency, [https://www.gov.cn/xinwen/2022-09/16/content\\_5710143.htm](https://www.gov.cn/xinwen/2022-09/16/content_5710143.htm), Sept. 16, 2022.

4 "China-Africa Digital Economy Cooperation Yields Productive Results", People's Daily, <http://world.people.com.cn/n1/2023/05/29/c1002-40000738.html>, May 29, 2023.

5 "Angola Vocational Skills Training Center Project Built with China's Aid Launched", Xinhuanet, <http://www.news.cn/silkroad/20240115/5c2eea63ccad4a0fad6db70219905482/c.html>, Jan. 13, 2024.

6 "Digital Leninism" refers to a new planned economy based on big data. In the era of big data, the planned economy will make plans more "intelligently" with the aid of algorithms.

7 "Africa's Digital Transformation Risks Falling into Geopolitical Competition," Africa Digital Watch, <https://www.essra.org.cn/view-1000-2084.aspx>, Feb. 25, 2021.



the African Union launched the New Africa-Europe Digital Economy Partnership in 2019. The United States reinforces the digital ecosystem led by U.S. standards through its digital assistance strategy. In 2020, the United States released its first-ever digital assistance strategy document, which uses American values as the normative standard for digital assistance to Africa, in a bid to establish a U.S.-led international digital ecosystem in Africa. This long-term fragmented governance mechanism implemented in Africa will lead to more fragmented rules on digital economy and impact China-Africa digital economy cooperation to a certain extent.

## **2.4 Cases of China-Africa cooperation in the digital economy<sup>1</sup>**

China-Africa cooperation in the digital economy has yielded notable results, and some typical models have been established in the fields of digital infrastructure, digital application and digital innovation. Driven by digitalization, the construction of digital infrastructure through China-Africa cooperation has built a reliable infrastructure and ICT support system for China and Africa. Extensive practice in the field of digital applications has brought tangible benefits to Chinese and African countries and their peoples, while cooperation in the field of digital innovation has given innovation vitality and development impetus to China-Africa cooperation. Many successful cases have emerged for cooperation in these three areas, which demonstrate the results of China-Africa cooperation in the digital economy, and are the culmination of the joint efforts of both sides. These offer valuable experience and examples for solving the problems in Africa's digital economy development, and also support China-Africa cooperation in reaching a new height. These cooperation results will lay a solid foundation for expanding China-Africa cooperative partnership, and open up a new path for achieving prosperity for all and sustainable development.

### **2.4.1 Digital foundation**

#### **(1) China Mobile International: Build “Digital Africa” communication network system and share new opportunities presented by the digital Belt and Road**

As China-Africa cooperation is being deepened, booming trade and sustained construction of “Digital Africa” raise broader demand for global network connectivity, telecommunications and information services.

As the Belt and Road Initiative extends from the infrastructure field to digital economy and the transition to digital and intelligent society, China Mobile International Limited (CMI) continues to broaden its service scope to help develop Africa's digital economy in a more comprehensive manner. Since its launch of business in the Middle East and Africa region in 2015, it has set up business support points in the United Arab Emirates, Kenya, South Africa, Saudi Arabia, Egypt, Congo (Brazzaville) and other countries and regions to serve the local market's needs for diversified information service. At present, CMI has over 230 overseas PoPs around the world, of which more than 20 PoPs are located in South Africa, Kenya, Nigeria and other African countries. These efficiently collaborate with over 80 cloud PoPs around the world to provide

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<sup>1</sup> Content of all cases collected from enterprise research and public information.

direct Internet connection and transmission services for this region and the world in a more cost-effective manner.

CMI participates in the digital Belt and Road and shares new opportunities presented by it. The 2Africa submarine cable invested by CMI is still under construction. With a total length of over 45,000 kilometers, 2Africa cable will be the longest submarine cable in the world when completed. It will be the first submarine cable system to provide continuous capacity on the African continent and connect countries in Africa, Asia (including the Middle East) and Europe at the same time. 2Africa cable will land in Côte d'Ivoire, Ghana, South Africa, Senegal, Tanzania, Djibouti, Nigeria, Gabon, Mozambique, Somalia, Kenya, Congo (Kinshasa), Congo (Brazzaville), Egypt and other countries. The design capacity of the core part of the subsea cable system is up to 180Tbps, more than the capacity of all current subsea cables in Africa put together. After completion, it is expected to bring more efficient and convenient international connection service to up to 3 billion users around the world, accounting for 36% of the world's population, and also bring more economic and social benefits to industries highly dependent on the Internet, such as education and healthcare. It is another milestone for CMI to promote the construction of infrastructure relevant to the Belt and Road Initiative.

CMI assisted the international airport in East Africa in upgrading infrastructure, including solar lighting, monitoring, weak current, communication and other projects. As an important hub for international routes in East Africa, this international airport is of long-term significance for promoting infrastructure upgrading and transformation in order to realize the connectivity of East Africa and improve modern services. It provides satellite communication services for overseas institutions and enterprises such as the Chinese Embassy in Eritrea and the China Medical Team in Eritrea to meet their communication needs, enhance Internet connectivity, and ensure stable communication and safe work in Eritrea. It provides one-stop service for leading enterprises in the logistics industry worldwide, and its network connection support service covers 12 countries and regions in Africa, helping them improve the transport efficiency of trunk logistics in South Africa, Tanzania, Mozambique, Zambia, Congo (Kinshasa), Zimbabwe, Malawi and other countries.

CMI continues to improve the ability to use digital and intelligent solutions for the African market. It promotes China-Africa trade and economic cooperation through digital and intelligent solutions, seizes current opportunities, fulfills political, economic and social responsibilities, works with partners to build "digital Africa", and provides strong support and stellar services for the joint implementation of the Belt and Road Initiative.

## **(2) Hengtong Optoelectronics: develop digital infrastructure and support Africa in improving regional connectivity**

As of 2023, there were about 21 subsea cables around the African coast, but the connectivity of African networks remains limited and fragile. Fiber-optic networks have not yet fully penetrated the continent, and network connection is slow, unreliable and expensive. In particular, landlocked countries such as the Central African Republic, Eritrea and South Sudan still lack fiber-optic connections to the subsea cables that surround the continent, and fiber-optic broadband service household penetration in sub-Saharan Africa is still less than 2%.

Hengtong International Marine Cable Systems Co., Ltd., established in Hong Kong in 2018 as a wholly-owned subsidiary of Hengtong Optoelectronics, is primarily responsible for the construction and operation of PEACE International submarine optical cable system. The cable, which has a total investment of over US\$1 billion, spans more than 25,000 kilometers across France, Pakistan, Egypt, Kenya and other countries, and extends to Southeast Asian countries such as Singapore as well as South Africa. In March 2024, the cable connecting Asia, Africa and Europe was put into operation. It provides high-speed and stable international communication bandwidth access leading to Asia and Europe for African countries, especially in East Africa and North Africa, and spurs the vigorous development of Africa's digital economy. Hengtong Optoelectronics has established a number of overseas bases, with South Africa and Egypt as strategic fulcrums. In South Africa, Hengtong acquired Aberdare Cables (Pty) Ltd., and rapidly became a leader in the field of smart energy connectivity in southern Africa. In 2019, AM Hengtong, a joint venture that was established with a local company, became the first optical communication product manufacturer in South Africa, which aims to meet the emerging needs of the African communications industry and strengthen the local communications infrastructure. In Egypt, Egypt Hengtong, a communication and power product delivery base set up by Hengtong, has greatly boosted the infrastructure production and construction capacity in the region. Thanks to the "going global" strategy, Hengtong Optoelectronics has fully exploited domestic and foreign markets and resources, ranking among the top three in the field of optical communication and marine communication in the world and becoming a Chinese national brand in the global field of optical fiber Internet. Furthermore, Hengtong Optoelectronics cooperates with the China-Africa Development Fund in carrying out investment consulting services in Aberdare, discussing further investment and financing cooperation in the field of African digital economy.

Hengtong Optoelectronics fulfills its social responsibilities by holding a wide array of public welfare and charitable activities in Africa, such as education and training, poverty alleviation through development, care for women, children and the disabled, and disaster relief, and conducts exchanges with the governments and people of the host countries to increase mutual trust and recognition. "Aberdare School", "Aberdare Care", "My Math Buddy" and other public welfare projects enjoy popular support. Because of Hengtong's outstanding contribution to the economic and social development of African countries, South African President Cyril Ramaphosa and Egyptian Prime Minister Mostafa Madbouly visited Hengtong Industrial Base for inspection and spoke highly of it.

### **(3) China-Africa Development Fund: Ten billion yuan engine – financial empowerment of China-Africa new cooperation in the digital economy**

As an important cooperation measure for Africa announced at the Beijing Summit of the Forum on China-Africa Cooperation (FOCAC) in 2006, the China-Africa Development Fund is not only China's first stock equity fund dedicated to African investment, but also an indispensable financial force in China-Africa trade and economic cooperation. President Xi Jinping announced at the Johannesburg Summit of the FOCAC in December 2015 that another US\$5 billion would be injected into the fund, bringing the total to US\$10 billion, making the Fund an important engine for China-Africa economic and trade cooperation. The China-Africa Development Fund has invested in key areas such as cooperation in production capacity,

infrastructure, energy and minerals, agriculture and people's livelihood, and has effectively spurred Africa's industrialization and sustainable development.

The China-Africa Development Fund has a representative office in South Africa, Ethiopia, Zambia, Ghana and Kenya each. So far, a total of 39 African countries have received more than US\$7.3 billion in investment decision-making, resulting in over US\$31.6 billion in investment and financing in Africa from Chinese enterprises. In the field of digital economy, it supports Chinese enterprises in stepping up investment in digital infrastructure in Africa, participates in the initial issue of A-shares by China Telecom and China Mobile, and promotes the construction of digital infrastructure in Africa in the fields of international submarine cables, cloud computing, fiber-optic cable backbone networks, and data centers, in order to improve Africa's digital infrastructure and foster China-Africa digital cooperation. At the same time, the China-Africa Development Fund has established a China-Africa digital economy cooperation platform and expanded the number of partners. It co-organized the Forum on China-Africa Digital Capacity Building Cooperation in October 2023, and continues to advocate the development of Africa's digital economy through the integration of finance and digital progress. On the basis of investment and financing support, the China-Africa Development Fund has fully exploited its experience and personnel advantages to provide planning, consulting and other financial intellectual services for Africa's industrialization. At the same time, it increases local employment, tax revenue and foreign exchange earnings through investment projects, fulfills its social responsibilities, helps upgrade and improve the quality of cooperation with Africa, and assists in building a closer China-Africa community with a shared future. Moreover, the China-Africa Development Fund leverages the role of development financing in "planning and investment" to help expand the pilot project in the field of digital agriculture. The pilot digital agriculture project, which is launched in cooperation with China Geo-Engineering Corporation in Ghana, has successively introduced five sets of drones from Chinese enterprises to serve local farmers on the basis of Harvest agricultural demonstration project. In 2023, it trained local farmers in Ghana on how to operate drones. One farmer is now able to complete the operation independently. The farmer has obtained the drone manipulator certificate after passing the examinations set by the Civil Aviation Authority of Ghana, and is working with local farmers to perform agricultural drone operation experiments. It has received enthusiastic response from local people.

As the principal platform for investment in Africa, the China-Africa Development Fund supports more Chinese enterprises in investing in Africa's digital economy, promotes the development of Africa's digital economy, facilitates the digital upgrading of Africa's industries, and provides more inclusive and stable Internet access service for local people, thereby helping to narrow the "digital divide".

#### **2.4.2 Digital application**

##### **(1) China TransInfo Technology: Focus on the field of Internet of Things (IoT) to aid the digital and intelligent transformation of aviation hubs**

Airports and aviation facilities on the African continent generally remain to be modernized, which are a significant obstacle to the development of airlines and make it difficult to improve the quality and efficiency of air services. As digital economy technology develops rapidly and

gains popularity, the unbalanced development of African countries is increasingly exposed. African countries lag far behind other developing countries in the application of IoT technology to the aviation industry.

As a leading digital enterprise in the field of transportation and IoT, TransInfo Technology has been committed to providing intelligent and efficient information technology integration services to customers worldwide since its establishment in 2000. The company operates in cutting-edge fields such as artificial intelligence, big data analysis, and cloud computing, and demonstrates unique advantages in the field of digital economy in Africa. In particular, TransInfo Technology has demonstrated its strength in leading digital transformation in the “ICT Project for Luanda New International Airport Terminal” in Angola. Luanda Airport, a core aviation hub in Angola, has undergone expansions and upgrading to satisfy the growing demand for air service. The airport and its supporting aviation city have an overall economy size of US\$16 billion and are expected to contribute US\$5 billion to Angola’s GDP and create about 170,000 jobs. In this project – an important part of the Chinese-Angolan bilateral cooperation project, TransInfo is primarily responsible for the modern, digital and intelligent upgrade of airport facilities, so that the airport can provide more efficient and convenient aviation services, promote the development of the local economy and create jobs. TransInfo Technology introduces advanced digital technologies such as video surveillance and intrusion detection through ICT integration technology to ensure airport safety and order. At the same time, flight inquiry, status display, emergency broadcast and notification services, as well as entertainment services significantly improve travel experience for passengers. By integrating the data from various subsystems, it realizes information sharing and collaborative management, optimizes the resource management of the airport, and improves operational efficiency. UPS system and power distribution facilities ensure stable power supply for the airport. The function center and large-screen display system realize centralized control and information display, which ensure airport security, provide accurate information, enhance communication efficiency, and also optimize resource management and protect power supply. Digital applications make airport operations more efficient and create a convenient and comfortable for passengers. It is an exploratory move by Luanda New International Airport to embrace the digital age in Africa.

Relying on state-of-the-art technology and rich experience, TransInfo Technology plays an increasingly prominent role in the development of Africa’s digital economy. It helps local airports to operate digital flights and tap the potential value of digital airports, contributing significantly to the upgrading and development of local aviation hubs through digital applications.



**Figure 2.1 ICT Project Integration Center at Luanda New International Airport**

**(2) Africa Star: Deepen China-Kenya cooperation and lead a new era of smart railways**

Africa has the highest number of landlocked countries in the world, yet its transport network density is far lower than that of other regions. In particular, in terms of railway construction, the length of railways in sub-Saharan Africa is only 56,000 kilometers, accounting for only 2% of the world's total railway length, but its transportation cost is 63% higher than that of developed countries. This undoubtedly impedes local economic development.

Kenya's standard gauge railway, the largest infrastructure construction project since the country's independence, is not only a flagship project for Kenya to achieve the Kenya Vision 2030, but an important milestone in China-Africa cooperation as well. Officially opened on May 31, 2017, it is operated and maintained by Africa Star Railway Operation Company Limited. The 600-kilometer-long railway is divided into the 480-kilometer-long Mombasa-Nairobi section and 120-kilometer-long Nairobi-Suswa section, which is built using Chinese standards, technology, management and equipment. Since its opening, the Mombasa-Nairobi Railway has become the preferred choice for Kenyan people, with an average occupancy rate of 92%. It is also a significant job creator, having recruited a total of over 3,000 local employees in 123 types of work in five specialties. At present, local employees engaged in the operation of Kenya's standard gauge railway account for 80%. It has promoted the development of the local economy and social progress, demonstrating the extensive participation nature of win-win China-Africa cooperation. Africa Star, in collaboration with China Telecom, provides stable and efficient Internet private line services for Kenya's standard gauge railway, which meets the day-to-day office needs of the operating company. It significantly improves the access efficiency of the financial system thanks to its product characteristics of low latency, low packet loss and low jitter. In addition, Kenya's standard gauge railway uses the IoT and big data analytics technology to provide intelligent solutions for cargo transport in Africa. Railway equipment can be monitored in real time and predictively maintained through sensors and data

analysis technology, ensuring its reliability and efficient operation. At the same time, the electronic payment system and online booking system make it more convenient to purchase and pay for tickets. Passengers can enjoy one-stop service such as viewing train information in real time, ticket booking and customer feedback through mobile apps or online platforms, increasing passenger satisfaction and loyalty.

As a model of China-Africa cooperation, Africa Star Railway Operation Company brings modern, digital and convenient railway travel experience to Kenya, and injects vitality into the local economic and social development.



**Figure 2.2 Wu Tongming (right) and trainee Kirumwa are inspecting the power generation car in the operation workshop in Nairobi, Kenya**

### **2.4.3 Digital innovation**

#### **(1) Transsion Holdings: Driving Local Innovation and Promoting Technological Upgrades**

Shenzhen Transsion Holdings Co., Ltd. is committed to becoming the most popular provider of smart devices and mobile services for consumers in global emerging markets. Since its inception, Transsion Holdings has been dedicated to providing users with high-quality multi-brand smart devices centered around mobile phones, while it also offers mobile Internet services based on a self-developed operating system and traffic gateways. In 2008, Transsion strategically entered the African market with a multi-brand strategy and achieved significant success. To date, it has garnered over 40% market share in Africa, ranking first in the industry.

In the African market, Transsion is bridging the digital divide through continuous technological innovation, achieving precise market positioning and breakthroughs in meeting diverse needs. As a core player in the global emerging mobile phone market, Transsion enhances its product competitiveness through sustained R&D investment and innovation in the mobile domain, conducting localized technological research to meet the usage habits of local users. Transsion has conducted extensive research in technological innovations in the fields of AI voice

recognition and visual perception, dark-complexion photography technology, intelligent charging and super power saving, cloud system software, intelligent data engine, new hardware materials, and OS system. Furthermore, Transsion has made breakthrough progress in imaging R&D, winning several international awards including the championship in the deep skin tone portrait segmentation track. By optimizing camera algorithms to suit African skin tones, Transsion enables African users to take more satisfactory photos, meeting customer needs and differentiating from other mobile phone brands. Additionally, Transsion's mobile phone brands are equipped with its independently developed smart terminal operating system (Transsion OS), which forms the basis for developing various utility applications such as app stores, game centers, and phone management tools, enhancing user experience and building a mobile ecosystem in overseas emerging markets. This ecosystem empowers global developers and consumers through development, testing, promotion, and monetization. Lastly, Transsion has established digital accessory brand oraimo and home appliance brand Synix to expand into new product categories. Simultaneously, it has set up multiple manufacturing centers and established over 2,000 after-sales service outlets worldwide, providing extensive after-sales support.

Transsion signed a memorandum of cooperation with the U.N. Economic Commission for Africa in Beijing on October 18, 2023. Both China and Africa, utilizing emerging technologies, big data, and innovative tools and platforms, are focusing on promoting research and analytical surveys of Africa's digital economy, providing valuable insights and policy recommendations for key areas of the African digital ecosystem. Currently, Transsion, through its mobile phone and mobile internet business, has established full-chain operations across all 54 African countries. Through localized team development and exploration within a large ecosystem, Transsion has built a comprehensive big data platform consisting of the Transsion cloud ecosystem platform TRANSSCMP and the media platform Sunnbird. This lays a solid foundation for the digital and intelligent infrastructure and user digital life scenario innovation in African countries.

## **(2) Wenhua Online: Transcending distances to co-crafting the African e-education ecosystem**

Tackling the digital divide, developing countries are in dire need of a digital revolution in the education sector. The fusion of education with intelligent information technology represents an essential trend.

Established in 2006, Beijing Wenhua Online Education Education Technology Co., Ltd. (Wenhua Online) has distinguished itself with its exceptional capabilities in educational technology. The company has earned the prestigious distinction of being the first to secure strategic investment from People.cn Co., Ltd., a centrally-owned enterprise. Additionally, Wenhua Online holds the milestone of being China's first educational technology company to expand on a global scale. Since 2018, Wenhua Online has been in a deep partnership with Huawei Technologies Co., Ltd. (Huawei), leveraging its comprehensive suite of digital and intelligent educational infrastructure technologies, which encompass cloud, pipe, edge, and device connectivity. By integrating these elements, they have established a streamlined architectural framework that facilitates the creation of a technological bedrock and application



ecosystem for educational institutions, designed to be limitlessly scalable and future-proof, thus delivering comprehensive, tailored smart education solutions to Africa. They have made significant inroads across 30 African nations, successfully implementing over 200 projects (including 10 state-level smart education projects) that span more than 1,000 undergraduate and vocational colleges, as well as three major African university associations. Those initiatives involve the digital transformation of traditional classrooms, establishing a unified access for smart, large-screen teaching. This enables one-click access to a wide array of educational content and instructional application tools from the cloud, fostering interconnected classrooms that transcend time and space. Those collaborative technologies seamlessly capture and archive classroom teaching content automatically, gathering comprehensive data throughout the educational process. They integrate with existing teaching applications through learning tools interoperability (LTI) and offer smart maintenance management for classroom equipment. This supports educational authorities and institutions in establishing advanced centers for resources, data, applications, and maintenance across various levels. Building on this integrated system, AI technology is harnessed to enhance every aspect of educational management. It provides comprehensive support for the sharing of new educational resources, fosters the innovation of teaching methodologies, and catalyzes the transformation of educational management practices. Beyond this, Wenhua Online has established a “National Knowledge Sharing Center” for an Egyptian ministry, deploying a self-contained digital education platform that streamlines teaching management, online examinations, and live streaming, thereby effectively facilitating the digital transformation of education practices across all universities under the ministry. Wenhua Online has developed an advanced smart education platform for the Ministry of General Education in Zambia, empowered by modern educational tools and resources, and has greatly elevated the quality and efficiency of tertiary education in the country. Wenhua Online has constructed a hybrid training platform for the China-Africa Vocational Education and Training Institute, enabling the institute to deliver a variety of O2O training programs to educators from over 256 vocational institutions across more than 20 countries in East and West Africa. The platform has also been instrumental in the successful facilitation of the 8th Africa Tech Challenge.

These initiatives exemplify Wenhua Online’s robust capabilities and profound expertise, contributing significantly to the digital transformation of the educational sector in Africa and beyond. By leveraging digital solutions to overcome geographical and temporal challenges, Wenhua Online is pioneering innovative applications of smart educational technologies, so as to provide enhanced educational services to teachers and students globally, thereby collaborating towards the creation of a holistic global smart education ecosystem.



**Fig. 2.3 Projects and platforms for smart education in Africa**

### **(3) CloudNeedle: CloudNeedle OS, the magic needle that breaks through operating system barriers**

As tech trends such as digital economy, indigenous innovation, new infrastructure, and data centers, continue to rise, the development and self-reliance of foundational information technology have become increasingly crucial. However, developing countries have long faced the challenge of being short on chips and operating system, as a result of technological constraints imposed by developed nations.

Zhejiang CloudNeedle Information Technology Co., Ltd. (CloudNeedle), an innovative leader focused on operating system development, is on a mission to usher in a new era of national data security and is dedicated to building itself into a pillar of stability in the realm of domestic operating systems. After seven years of technical refinement and application exploration, CloudNeedle has successfully engineered a purely domestic and self-developed new framework. Following the dual standards of being “self-developed and controllable” and “secure and reliable”, the company has meticulously compiled its CloudNeedle OS from scratch. This OS breaks free from the shackles of conventional operating systems like Windows, Android, and iOS, delivering seamless interoperability with an extensive range of computing facilities with chipsets, and software platforms in both international and domestic spheres. Technically, it masterfully integrates the cloud-edge-device continuum, forging a unified and interconnected product ecosystem. This ecosystem proliferates across an array of sectors, including smart education, smart offices, smart hospitality, smart gaming, and smart healthcare, providing premier solutions that are driving the digital transformation across various sectors. The company has to date filed over 120 intellectual property applications and has received several industry-recognized credentials, including the operating system security certificate awarded by the Public Security Bureau, the desktop operating system reliability test conducted by the

Ministry of Industry and Information Technology, the sales permit for specialized products of computer information system security, and the ICP certification. CloudNeedle OS has become the first Chinese operating system to gain international recognition and to demonstrate its competitive edge in the global market.

CloudNeedle is advancing in lockstep with China's diplomatic initiatives, leveraging its product suite and industry-wide solutions to actively engage in Africa's digital transformation, contributing to the growth of digital economy in this region. In 2023, the company signed a memorandum of cooperation with Sarah Baartman District Municipality, South Africa, leveraging emerging technologies, cloud computing, big data, the Internet of Things, and innovative tools and platforms to establish a demonstrative sample of digital industrial upgrading and bilateral trade integration for the surrounding regions and countries. This initiative aims to empower key areas of South Africa's digital ecosystem, including municipal digitization, smart cities, the construction of the CloudNeedle Intelligent Computing Center (CICC), and digital trade, thus opening new "digital trade routes." Additionally, CloudNeedle maintains deep cooperation with regions such as Johannesburg and Cape Town in smart water management, digital urban governance, and e-governance services. Looking ahead, CloudNeedle plans to center around Sasolburg, starting from Ndlambe Municipality, and continuously expand to the Eastern Cape and other regions, utilizing CloudNeedle's cost-effective full range of products to collaboratively build CloudNeedle Intelligent Computing Centers (CICC) across more regions in Africa, providing comprehensive support for local computational infrastructure construction and promoting intelligent industrial upgrades.



**Fig. 2.4 Signing Ceremony for BASI IT Strategic Cooperation between CloudNeedle & Sarah Baartaman**

## Chapter III Kenya's Digital Economy and China-Kenya Cooperation in Digital Economy

*Kenya, an integral partner in the “Belt and Road” Initiative (BRI), has become a significant recipient of Chinese investment and enjoys a profound cooperative relationship with China. As a pivotal trade collaborator for Kenya, China is now delving into collaborative efforts in the burgeoning digital economy. Together, the two nations aim to leverage shared successes and mutual benefits across sectors, including infrastructure and technology. The potential for collaborative advancement between China and Kenya in the digital economy is exceptionally promising. Guided by the BRI, both parties are actively capitalizing on the vast opportunities in the digital economy, engaging in a rich tapestry of bilateral cooperation that spans multiple dimensions.*

### 3.1 Evolution of Kenya’s digital economy

Kenya’s digital economy took root in the early 1990s with the government’s initial foray into market-oriented applications of ICT, laying the groundwork for policies to foster digital tech advancement. This strategic step has led to notable successes in mobile communications and Internet services, thus creating a favorable environment for private investment and tech innovation. As the new millennium dawned, Kenyan authorities rolled out market liberalization initiatives to further stimulate the digital economy’s growth. A landmark in this journey was the 2007 introduction of the M-PESA mobile payment system, an innovation that profoundly influenced Kenya and captured worldwide attention as a model for mobile finance.

As a pioneer and leader in Africa’s digital revolution, Kenya has long prioritized the development of its digital economy. In 2008, the Government of Kenya unveiled its “Vision 2030”, aiming to build a society that flourishes economically, socially, and politically, with a special emphasis on the critical role of digital technology in enhancing national competitiveness and prosperity<sup>1</sup>. By the 2010s, the government’s commitment to the digital economy was further solidified through its National Broadband Strategy in 2013, which aimed to expand broadband Internet coverage and improve service quality<sup>2</sup>. Concurrently, the government actively promoted the e-government service, exemplified by the establishment of the eCitizen portal to elevate its digital public services. To foster financial inclusion, the government encouraged financial technology innovation, including digital banking services and online payment platforms. The Ministry of Information, Communication and the Digital Economy (MICDE) also launched various initiatives targeting the ICT sector’s growth, providing support for youth and entrepreneurs and stimulating research and innovation in the field.

In 2019, the Government of Kenya launched the Kenya Digital Economy Blueprint, which articulated five key pillars of its digital economy including digital government, digital business,

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<sup>1</sup> Kenya Vision 2030, 2021, <http://vision2030.go.ke/>.

<sup>2</sup> National Broadband Strategy, “Communications Authority of Kenya”, <https://www.ict.go.ke/wp-content/uploads/2019/05/National-Broadband-Strategy-2023-FINAL.pdf>.

infrastructure, innovation-driven entrepreneurship, and digital skills and values<sup>1</sup>. Building on this momentum, during the Connected Kenya Summit in April 2022, the government unveiled the Kenya National Digital Master Plan 2022-2032. This strategic blueprint serves as a roadmap for Kenya’s digital transformation over the next decade, showcasing the country’s leading position and long-term vision in the realm of digital advancement<sup>2</sup>. As a frontrunner in Africa’s digital economy, Kenya possesses immense developmental potential. In 2023, the Government of Kenya announced the establishment of a roadmap aimed at achieving the nation’s goal of becoming a digital hub in Africa in the coming years<sup>3</sup>.

## 3.2 Basic characteristics of Kenya’s digital economy development

### 3.2.1 A frontrunner in digital infrastructure in Africa

Kenya’s ICT sector is rapidly advancing, with its Internet development ranking at the top among African nations, earning it the nickname “Silicon Valley of Africa”. Data from Table 3-1 illustrates that Kenya’s digital infrastructure performance across various aspects is particularly prominent in Africa. Notably, indicators such as international broadband speed and mobile communication penetration rate significantly exceed the regional average, providing a solid foundation for the growth of the digital economy.

**Table 3-1 Comparison of digital indicators between Kenya and other regions of Africa**

Indicator	Kenya	East Africa	West Africa	South Africa	North Africa	Central Africa
3G network coverage	98.00	85.13	84.85	88.99	99.07	88.10
International broadband speed	1080.00	224.05	23.86	68.93	99.80	13.90
Mobile broadband charges	5.75	6.08	4.90	5.00	4.19	3.31
Fixed broadband charges	11.00	24.41	40.50	19.30	14.45	17.60
Mobile communication penetration rate	121.70	79.57	105.18	107.94	118.28	75.08
Proportion of fixed broadband subscriptions	1.48	0.74	0.56	3.79	10.00	1.27
Proportion of mobile cellular subscriptions	121.67	79.57	108.34	105.10	117.27	75.08

1 Kenya ICT Authority, “Kenya Digital Economy Blueprint”, <https://www.ict.go.ke/wp-content/uploads/2019/05/Kenya-Digital-Economy-2019.pdf>.

2 Kenya ICT Authority, “The Kenya National Digital Master Plan 2022-2032”, <https://cms.icta.go.ke/sites/default/files/2022-04/Kenya%20Digital%20Masterplan%202022-2032%20Online%20Version.pdf>.

3 Kenya to Build Africa Digital Hub, XHF.com, [https://www.cnfn.com/hg-lb/detail/20230127/3792302\\_1.html](https://www.cnfn.com/hg-lb/detail/20230127/3792302_1.html).

Regarding international internet connectivity, Kenya's coastal location confers a significant advantage in global internet access. Since 2009, submarine cables have become the primary means of Internet connection for the country. As of 2023, Kenya is connected to the world through six submarine cables, with an international broadband capacity of 1080 kbit/s, placing it at the forefront in Africa<sup>1</sup>. Kenya also excels in the fiber optic backbone and metropolitan networks, boasting a 3G network coverage rate of 98% and a mobile communication penetration rate of 121.7%. The Government of Kenya confirmed at the second preparatory meeting of the ITU World Telecommunication Standardization Assembly in 2024 that, over the past year, it has deployed 8,419 kilometers of fiber optic network. The goal for the next five years is to extend this to 100,000 kilometers. The Cabinet Secretary for MICDE in Kenya has announced that the government has commenced a nationwide rollout of 1,000 kilometers of fiber optic network and 25,000 Wi-Fi hotspots, along with the establishment of 1,450 digital centers in villages<sup>2</sup>. This initiative ensures stable signal access across the country, whether one is traveling by train or car, or situated in the rural countryside. From a user access perspective, Kenya offers fixed and mobile broadband rates that are below the average, providing significant benefits to its citizens. The Government of Kenya, partnering with local telecom operators, is actively expanding and upgrading mobile networks to achieve the "last kilometer" of connectivity. This enhances the user experience of Internet access for end-users and fosters innovation in service content and delivery methods. In March 2021, Kenya became the second country in sub-Saharan Africa to launch 5G services after South Africa, bringing faster Internet experiences to millions of its citizens. Additionally, the Universal Service Fund (USF) and other government initiatives are driving the expansion of Internet access to rural and underserved areas. Since 2013, the USF has raised 5.3 billion Kenyan shillings (approximately US\$53 million) to fund projects that extend network connectivity, focusing on the "last kilometer" of community broadband to bridge the urban-rural digital divide and promote digital inclusion for all<sup>3</sup>.

### **3.2.2 Market diversification in digital applications**

#### **(1) Digital finance: one of Africa's most established mobile payment markets**

Kenya is acknowledged as one of Africa's most established markets for mobile payments, with widespread adoption of financial technologies like mobile payments, mobile money, and micro-loans. Thanks to mobile payment solutions, the country's digital financial services penetration has surged from 27% in 2006 to a current rate of 80%. M-PESA, a mobile payment system launched by Kenyan telecommunications company Safaricom in 2007, reached the milestone of one million users within just 239 days of its inception. Currently, M-PESA holds a dominant position in Kenya's mobile payment market with a 70% share of users and an 85% share of transactions. The service has expanded from its initial offerings of personal transfers, short-term loans, bill payments, and salary disbursements to encompass various aspects of daily life, including shopping, healthcare, and education. It has become a household name for payment

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1 China's Peace cable linking Europe and Africa arrives in Kenya, C114, <https://www.c114.com.cn/news/116/a1192143.html>.

2 Kenya Invests in Fiber Optic Networks to Expand Broadband Infrastructure, ICCSZ, <http://www.iccsz.com//Site/CN/News/2024/03/17/20240317080205297814.htm>.

3 World Bank, "Kenya Digital Economy Assessment", <https://thedocs.worldbank.org/en/doc/345341601590631958-0090022020/origin/DE4AKenyasummarypaperfinal.pdf>.

solutions across many African nations, including Kenya, and boasts approximately 50 million users on the continent who conduct over one billion transactions monthly. In addition to M-PESA, Kenya has launched Copia, an e-commerce platform designed to cater to the needs of low- and middle-income consumers in rural areas. Securing US\$26 million in funding in 2019, Copia has expanded using community-driven models unique to Africa. It has served over a million customers, contributing more than USD six million to community economies and directly benefiting over 25,000 households<sup>1</sup>. In Nairobi, Capital of Kenya, over 50 local fintech companies are emerging, with the majority focusing on the mobile payments sector.

## **(2) E-commerce: One of the fastest growing regions for e-commerce in sub-Saharan Africa**

Kenya ranks the 56th globally and the 3rd in Africa in terms of the e-commerce market. According to the latest data from Statista, the annual revenue of Kenya's e-commerce market is projected to reach US\$4.492 billion by 2025, with the number of e-commerce users expected to hit 32.1 million<sup>2</sup>. Although most leading e-commerce platforms, such as Jumia and Kilimall, are not homegrown, they play a crucial role in offering diverse services, particularly in meeting the growing demand for online shopping locally. The Government of Kenya is also actively promoting the growth of e-commerce by improving relevant laws and regulations and advancing digital transformation strategies. Looking ahead, Kenya's e-commerce market is expected to continue expanding, with local platforms such as Copia and Tushop poised to become significant players, further driving the diversification and localization of e-commerce in Kenya. Moreover, as technology advances and innovates, more e-commerce solutions tailored to local needs and consumer habits will emerge in Kenya.

Kilimall, a leading online shopping platform in Kenya, has emerged as a key player in the East African e-commerce market. It caters to the shopping demands of consumers in Kenya and across Africa by providing an extensive selection of goods, from electronics and fashion apparel to home essentials. As Kenya's digital economy thrives, Kilimall has bolstered its market presence by improving service quality and user experience. The platform is now firmly established in Kenya's e-commerce landscape, having attracted a substantial local following and expanded its reach to other African nations such as Uganda and Nigeria through cross-border initiatives. Kilimall's success underscores the potential and growth momentum of Kenya's e-commerce sector and reflects the country's advancements in digital economic development.

## **(3) Digital education: digital transformation in education empowered by digital techs**

Kenya has seen notable advancements in the digital education sector, especially in enhancing the quality of education and expanding access to learning opportunities. On one front, the government has championed online learning initiatives, such as the Digital Learning Program (DLP) initiated in 2016. This program equips students with tablets and digital learning materials, enhancing learning efficiency and integrating technology into education, thereby raising its quality. Online platforms such as eLimu and Shupavu291 offer interactive tools and resources

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<sup>1</sup> Mobile Payments are Growing Rapidly in Kenya, People.cn, <http://world.people.com.cn/n1/2023/0315/c1002-32644406.html>.

<sup>2</sup> Statista, <https://statista.com>.

that cater to personalized learning needs. Furthermore, the Kenya Institute of Curriculum Development (KICD), backed by the Ministry of Education, has developed online learning resources<sup>1</sup>. The government has also encouraged the broadcast of educational programs on television and radio. KICD provides a range of subjects for primary and secondary education via EduChannel TV and its online platform. Some educational institutions have adopted innovative digital education models. During the COVID-19 pandemic, a collaborative effort between the government and the private sector ensured the continuity of learning by delivering educational content through both television and online platforms.

On another front, smart classrooms have been established. To address the digital divide and aid developing countries in their digital transformation, Guangzhou Createview Education Technology Co., Ltd. and the International Centre for Higher Education Innovation under the Auspices of UNESCO (UNESCO-ICHEI) have jointly established the International Institute of Online Education (IIOE) project<sup>2</sup>. Guided by UNESCO's Africa Priority Strategy, UNESCO-ICHEI has initiated the "IIOE National Center" program. It has established the IIOE Kenya National Center and smart classrooms at the University of Nairobi, which were officially launched in April 2022<sup>3</sup>. This initiative is set to empower Kenya's higher education sector through digital transformation, aiming for a more sustainable, inclusive, and equitable future.

#### **(4) Digital mobility: a promising market in Kenya**

Kenya's digital mobility market has been booming, with standout growth in ride-sharing and mobile payment services. Key digital platforms such as Uber, Bolt (formerly Taxify), and Little, have made a mark by offering user-friendly application interfaces that facilitate easy booking and payment for transportation services. Uber, an early entrant to Kenya in 2015, has made significant strides in delivering dependable and accessible transportation, making Kenya its second-largest market globally. Meanwhile, Bolt and Little are also gaining traction, with their sales consistently rising as they draw users in with competitive pricing and localized offerings. These platforms extend beyond traditional taxi services to include motorcycle and pedicab services that resonate with Kenyan transportation preferences. The uptake of digital transport services is escalating, particularly among the youth and tech-proficient segments. As smartphone penetration and Internet connectivity increase, an ever-growing number of Kenyans are leveraging digital platforms for their daily commutes. This shift allows users to enjoy the convenience of booking rides through applications and to readily compare the pricing and quality of services from different providers. Overall, Kenya's digital mobility market exhibits strong growth potential. As technology advances and consumer demands evolve, the market is expected to expand further, bringing forth more innovative mobility solutions.

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1 World Bank, "Kenya Digital Economy Assessment", <https://thedocs.worldbank.org/en/doc/345341601590631958-0090022020/original/DE4AKenyasummarypaperfinal.pdf>.

2 International Institute of Online Education (IIOE) — An Open Network Platform for Promoting Digital Transformation of Universities and Teachers in Developing Countries, World Internet Conference, [http://cnsites.chinadaily.com.cn/wic/2021-11/25/c\\_166969.htm](http://cnsites.chinadaily.com.cn/wic/2021-11/25/c_166969.htm).

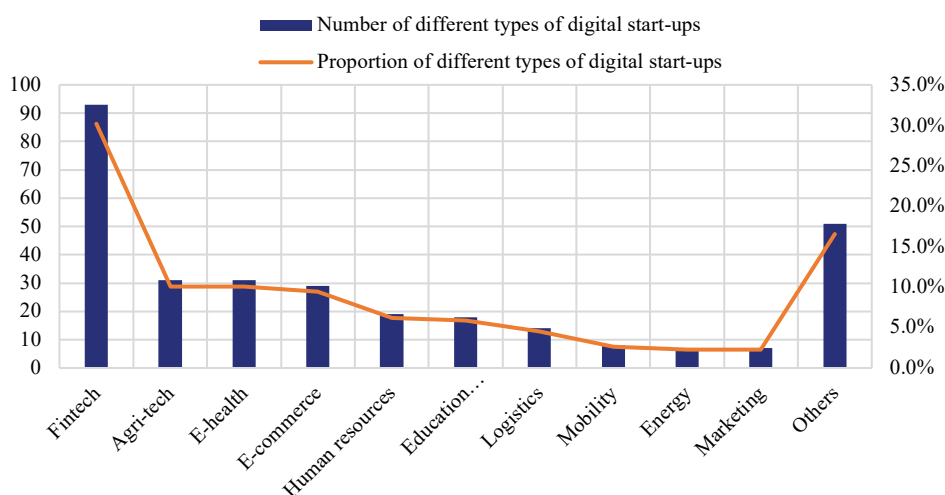
3 UNESCO, <https://cn.ichei.org/dist/index.html#/>.



### 3.2.3 Fintech-led digital innovation

Kenya, a vanguard of technological advancement in East Africa, has prioritized digital innovation as a key engine for economic growth. Recent years have seen notable progress in Kenya’s digital innovation landscape, highlighted by the following characteristics.

The digital startup and innovation scene is dynamic. As of 2023, Kenya is home to 247 operational digital innovation hubs that offer extensive collaborative spaces, incubation services, and acceleration programs, fostering a wealth of startup projects. Fintech emerges as the leading sector with the highest number of startups<sup>1</sup>. There are 93 start-ups, representing 30.2% of Kenya’s total, which is triple the number found in the second-largest sector, encompassing electronic health and agricultural technologies, as depicted in Fig. 3-1.



**Fig. 3.1 Number and proportion of different types of digital startups in Kenya**

Digital high-tech industries in Kenya are accelerating, bolstered by the country’s strengthening tech infrastructure and government support for innovative technologies. The nation has shown significant momentum in advanced fields such as blockchain, artificial intelligence (AI), data analytics, and cloud computing. For instance, AI technology is predominantly utilized in the financial sector to assess the creditworthiness of borrowers. In agriculture, it helps to analyze weather patterns and detect pests and diseases. Meanwhile, in the health sector, AI is being increasingly applied to tackle complex challenges faced by the medical sector<sup>2</sup>, demonstrating its broad and growing utility.

Progress in nurturing digital professionals is evident in Kenya, where both the government and the private sector are committed to enhancing the digital competencies of the workforce. The government’s efforts are largely channeled through the educational system, with a focus on introducing information technology and digital skills courses at tertiary institutions, including the University of Kenya. The private sector plays its part by offering internships and training programs to build digital expertise among professionals. Moreover, international partnerships

<sup>1</sup> Disrupt Africa, “Kenyan Startup Ecosystem Report 2022”, <https://disruptafrica.com/2022/12/07/kenyan-startup-ecosystem-ranks-highly-for-acceleration-diversity-shatters-funding-records/>.

<sup>2</sup> Chen Weibing, Yuan Jianheng: Report on the Development of Kenya’s Digital Economy [M]// Liu Jisen Research Report on Industrial Issues In Africa (2023), Beijing: Social Sciences Academic Press, 2023: 69-98.

with tech leaders such as Microsoft and Google further enrich the resources available for cultivating digital professionals in the country.

### **3.3 Cases of China-Kenya Cooperation in Digital Economy**

Since the establishment of diplomatic ties on December 14, 1963, China and Kenya have forged a robust partnership, evidenced by a series of collaborative agreements, such as the Agreement on Economic and Technical Cooperation, China-Kenya Bilateral Trade, and Agreement on Promotion and Protection of Investments. Additionally, a bilateral economic and trade joint commission mechanism has been established<sup>1</sup>. China, as Kenya's principal economic and trade partner, has been actively pursuing cooperation in the information communication and e-commerce sectors to share technological achievements and benefit from the development of the digital economy, thereby achieving mutual benefits and win-win outcomes. Since President Xi Jinping proposed the "Digital Silk Road" in 2017, China has continuously advanced digital connectivity with partner countries, assisting Africa in building a digital economy, and thus injecting new momentum into the BRI.

Kenya, a pivotal country along the BRI, has reaped substantial benefits from the "Digital Silk Road". The bilateral cooperation between China and Kenya in the digital economy has led to a variety of successful projects, ranging from fiber optic cable laying, to the establishment of 5G base stations and data centers, and to "soft connectivity" through institutional and regulatory frameworks to build a shared future in cyberspace. As a result, Kenya's digital infrastructure has been significantly bolstered, with a marked increase in the adoption of e-commerce, mobile payments, and social media. This has created a vibrant atmosphere for talent cultivation and technological innovation. Alongside these advancements, initiatives aimed at leveraging digital technology for poverty reduction and better life are underway, presenting Kenya with opportunities to close the digital divide and integrate more fully into the global economy. China, drawing on its strengths in infrastructure and IT, continues to enrich its digital economic partnership with Kenya, sharing its extensive experience in digital development. This partnership is designed to benefit the Kenyan people through the "Chinese model" and to support Kenya's transition to a digital economy across all sectors. Concurrently, this collaboration has also served to strengthen China-Kenya relations, enriching the international product development experience of Chinese multinational companies and enhancing China's voice on the global stage.

Recent years have seen several high-level meetings between China and Kenya, underscoring a shared commitment to digital economy. In November 2020, the Forum on China-Africa Media Cooperation took place in Nairobi to mark the 20th anniversary of the Forum on China-Africa Cooperation (FOCAC), with a focus on "China-Africa Media Cooperation in the Digital Era". African delegates highlighted the positive impact of digital technology in enabling Africa to narrate its own stories<sup>2</sup>. Under the BRI and FOCAC, in January 2022, China and Kenya inked a Memorandum of Understanding on Enhancing Investment Cooperation in the Digital

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<sup>1</sup> Ministry of Commerce of the People's Republic of China, the Foreign Investment Guide of the People's Republic of China - Kenya (2022), <https://www.mofcom.gov.cn/dl/gbdqzn/upload/kenniya.pdf>.

<sup>2</sup> Forum on China-Africa Media Cooperation in the Digital Era by FOCAC, Sohu.com, [https://www.sohu.com/a/432727118\\_115239](https://www.sohu.com/a/432727118_115239)

Economy, providing a solid institutional foundation for continuously deepening cooperation in digital economy for both sides. In the same month, both sides also signed additional six MoUs and agreements covering trade, infrastructure and other sectors, with a focus on cooperation in big data, ICT, cybersecurity and e-governance, agreeing to strengthen collaboration in capacity building and technology transfer<sup>1</sup>. In October 2023, Kenyan President William Ruto was invited to attend the Third Belt and Road Forum for International Cooperation, at which he engaged with Chinese business owners from pivotal sectors such as clean energy, AI, financial service, modern agriculture, rail transit and biomedicine, and expressed a desire to further enhance cooperation with them on exploring new avenues in technology and digital practices, thereby elevating the partnership to a new level and forging a new chapter of comprehensive cooperation for sustainable development and mutual benefit<sup>2</sup>.



**Fig. 3.2 Kenyan President Ruto is delivering a speech on the achievements of China-Kenya cooperation**

### **3.3.1 Ahadi supports the proliferation of digital services in Kenya**

Ahadi Corporation, established by Zhou Tao in Nairobi, Kenya in 2018, is an innovative enterprise committed to delivering high-quality, convenient, and affordable digital infrastructure services to low- and middle-income communities in Africa. The company has developed “Konnect Internet”, the world’s largest last-mile fiber WiFi community broadband network, dedicated to bridging the digital divide in Africa and boosting the economic development and living standards in local communities. Konnect Internet exemplifies how Chinese companies can leverage innovative technology and localized operations to provide high-quality and affordable digital infrastructure for the African people, thereby empowering local economic and social development.

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1 Kenya and China: Signing Six Cooperation Agreements on Trade and Infrastructure, Global Geological Mineral Resources Information System, <http://ggmeta.cgs.gov.cn/DepositsNewsCen.aspx?id=3853>

2 Kenya China Chamber of Commerce: Practitioner of “Belt and Road” Initiative and a Bridge for China-Kenya Cooperation, China.com, <https://digi.china.com/digi/20231230/202312301465454.html>

Konnect Internet’s success hinges on Ahadi’s adoption of a community-based “Infrastructure as a Service” (IaaS) model, which encompasses three key strategies: hyper-local operations that recruit and train local youth, creating employment while ensuring services meet the specific needs of the community; tailor-made services that offer flexible Internet packages with daily, weekly, or monthly payment options, aligning with the consumption patterns of low- to middle-income groups; innovative payment solutions, such as mobile payments, significantly lowering the barrier to access and enabling a sustainable business model. This approach, tailored to local contexts and preferences, not only provides high-quality digital connectivity but also fosters employment and the enhancement of digital skills, injecting lasting momentum into community growth. Additionally, Ahadi plans to incubate applications for e-commerce, payment, and logistics on the Konnect network, aiming to establish an inclusive and sustainable digital ecosystem.

Ahadi’s successful practices exemplify the vast potential of China-Africa cooperation in the digital economy. The coordination of Chinese technological innovation with localized operational strategies is not only narrowing the digital divide in Africa but also spurring social advancement on multiple fronts, including job creation and education, laying the foundation for a more inclusive and sustainable digital future. Going forward, Ahadi intends to expand its operations to more African countries, reaching hundreds of millions of individuals. It also plans to integrate services such as clean hydroelectric power, digital payment solutions, and online educational resources to fully cater to the digital requirements of low- to middle-income communities, thereby supporting the United Nations’ Sustainable Development Goals (SDGs).

### **3.3.2 Kilimall, a Chinese e-commerce platform rooted in Africa**

Kilimall, established in Kenya in 2014, stands as the premier e-commerce platform in East Africa and a localized China-Africa e-commerce platform that caters to the continent’s needs. It has become a beloved online shopping destination for African consumers. The platform’s service offerings cover e-commerce trading, mobile payments, and cross-border logistics, serving around 300 million Africans and amassing a user base of over 10 million. With a concentrated business scope in Kenya, Uganda, and Nigeria, Kilimall has spurred more than 10,000 jobs within the local and regional African economies.

In Kenya, Kilimall serves about five million consumers, partners with over 8,000 businesses, and operates more than 12,000 stores with a product range exceeding one million items. While gaining the favor of African consumers through speed and quality, Kilimall also provides employment and start-up opportunities for the local residents, enabling them to actively engage in the full e-commerce industry chain and truly benefit from the digital economy. The platform currently offers over 5,000 jobs in Kenya and plans to open a dedicated online recruitment section to not only promote local employment but also help investors’ foray into the African market to find the right people. Additionally, Kilimall is actively seeking local quality partners to join its network. China’s successful practices in e-commerce can assist Kenya in filling the gaps in this sector. In Kenya, there are over 1,500 KiliShops, covering all the country’s urban areas, and almost all are run by locals.

Additionally, China is aiding Kenyan products to “go global” through e-commerce. During the China-Middle East & North Africa International Trade Digital Expo (CCPIT), there were

13,990 visitors from Africa, with 5,929 Kenyan traders actively engaging with 1,026 Chinese exhibitors. This event attracted 30 African companies to participate, showcasing a range of products including agricultural commodities such as coffee, black tea, and nuts. This initiative has significantly boosted Kenya's manufacturing exports and the growth of e-commerce in the country.

### **3.3.3 M-Pesa partnering with Huawei to advance Kenya's digital finance**

Safaricom, a top mobile operator in Kenya, introduced M-Pesa, a mobile payment wallet, in 2008 to instant success. Yet, the surge in users to 15 million by 2013 put a strain on the platform's capacity. Confronted with this challenge, Safaricom sought a dependable tech partner capable of upgrading the system.

As Safaricom's longstanding and trusted telecom device partner, Huawei, guided by its customer-centric ethos, committed to a project to address the platform's challenge after extensive discussions. In nearly two-year collaboration with Safaricom and Vodafone Group, Huawei dispatched over a hundred R&D technicians to Kenya. Working closely with local staff in relentless shifts, they improved the system through iteration, testing, and piloting. The effort culminated in April 2015 with the launch of Huawei's M-Pesa G2, doubling the user capacity from 15 million to over 20 million, enabling seamless scalability, and enhancing the system's speed and stability.

Following M-Pesa's success in Kenya, Huawei has rolled out Mobile Money platforms in Tanzania, Mozambique, Lesotho, the Democratic Republic of the Congo, and Ghana, thereby replicating Kenya's success and establishing M-Pesa as Africa's most renowned mobile wallet brand. As mobile payments rapidly evolve, Huawei's team deepens its understanding of mobile payment and inclusive finance, tailoring features to local market demands by leveraging China's mobile payment experience. In January 2019, Huawei and Safaricom launched Fuliza, an adaptation of China's Huabei for M-Pesa, which quickly gained popularity among locals.

Spanning over a decade, M-Pesa has expanded its services from simple personal transfers to encompass every facet of modern life, such as shopping, healthcare services, and education, thereby democratizing the ease and joy of mobile payments across Kenya.

### **3.3.4 Luban Workshop, focused on cultivating digital information technology talents**

Luban Workshop, an initiative originated in Tianjin, is a prestigious international vocational education cooperation project and a significant facilitator in the advancement of the BRI.

During the FOCAC held in Beijing in September 2018, China committed to establishing 10 Luban Workshops in Africa to provide vocational skills training for African youth. In December 2019, the Luban Workshop in Kenya was inaugurated, a collaborative effort between Tianjin City Vocational College and Machakos University. This marks the second Luban Workshop established by Tianjin in Africa, with the goal of cultivating urgently needed high-level technicians in the ICT sector for Kenya's economic and social development. The workshop collaborates with Huawei, adopting Chinese vocational education for international standards and the Engineering Practice and Innovation Project (EPIP) teaching model to offer specialized

training in cloud computing and information security management at Machakos University, as well as providing professional technical skills training for local enterprises. The Luban Workshop in Kenya's teaching standards for "Cloud Computing Technology Application" has been evaluated and certified by the Commission for University Education. Additionally, the branch of Luban Workshop at the Meru University of Science and Technology was inaugurated in September 2023.

Serving as a conduit, the Luban Workshop facilitates the sharing of premium vocational educational resources between China and Kenya. It delivers a comprehensive suite of academic and vocational training programs in ICT to Kenya, nurturing a host of local professionals skilled in computer networking technologies, standards, and products. The Workshop's approach is tailored to local needs, employing a blend of industry-education integration and collaborative partnerships between schools and businesses. It helps to create an exemplary model for ICT professional cultivation that is both effective and replicable, aligning with Kenya's socioeconomic development requirements and benefiting a wide array of students and enterprises. Additionally, the Luban Workshop has played a pivotal role in advancing Kenya's vocational education sector, bolstering the country's indigenous innovation capabilities and its ability to develop independently. This has had a positive impact on Kenya's socioeconomic growth and its journey towards modernization. By bridging a gap in vocational education cooperation between the two nations, the Workshop has also enhanced people-to-people exchanges and cooperation. With its sustainable and promising framework, the Workshop sets a precedent for cooperation in various domains, providing a wealth of practical experience for the broader China-Kenya partnership.

## Chapter IV Suggestions for China-Africa Cooperation in Digital Economy

*Under the strategic guidance of Chinese and African leaders, China and Africa have achieved phased results in digital economy cooperation. As China-Africa cooperation enters a new phase of high-quality development, deepening and solidifying cooperation in the digital economy becomes particularly crucial. This chapter aims to clarify the key directions for China-Africa cooperation in the digital economy, by building upon the analysis of the African digital economy's development trends and in-depth discussion of the current state and potential issues of China-Africa cooperation presented earlier. It will provide a forward-looking perspective on the macro trajectory and actionable recommendations for China-Africa cooperation in the digital economy, with the aim of further broadening the areas of cooperation, enhancing the level of collaboration, and ultimately achieving mutual prosperity and development in the digital economies of China and Africa.*

### 4.1. Macro-direction for China-Africa Cooperation in Digital Economy

#### 4.1.1 Strengthening Top-level Design to Deepen the Scope of China-African Digital Economy Cooperation

In line with China's Two-Step Strategic Plan, the African Union's *Agenda 2063*, and the development strategies of various African countries, the "Belt and Road Initiative" and "Development Corridors" serve as breakthroughs. Building on existing frameworks such as the "Ten Major Cooperation Projects," "Eight Initiatives," "Nine Programs," and the *China-Africa Cooperation Vision 2035*, China and Africa have capitalized on the foundational successes of their collaboration. This partnership has spurred the advancement of the digital economy, providing developing nations with a competitive edge to leapfrog in development. Within the Forum on China-Africa Cooperation, efforts have been intensified to deepen the "China-Africa Digital Economy Innovation Program" and implement the *Initiative on International Trade and Economic Cooperation Framework for Digital Economy and Green Development*. The approach involves "detailed planning, stable paths, filling gaps, and enhancing effectiveness" to precisely meet effective demands and deepen the scope of China-Africa cooperation in the digital economy.

At the planning level, China and Africa should leverage synergistic effects, tailoring innovative efforts to the unique aspects of Africa's digital economy development and fully exploring the potential of China-Africa Cooperation in the digital economy. In terms of pathways, there should be a stable advancement in the construction of digital technology infrastructure, gradually expanding into digital application services and integrated innovation sectors, thereby strengthening the resolve for digital cooperation. In addressing gaps, the mode of cooperation should transition from "blood transfusion" and "blood production" to a more flexible "blood activation" approach, driving sustainable development of the China-Africa cooperation in the

digital economy through mutually beneficial commercial partnerships. Finally, in enhancing the effectiveness of cooperation, efforts should center on bridging the "digital divide" to unlocking the "digital dividend," continuously bolstering the inclusiveness of China-African digital cooperation.

#### **4.1.2 Consolidating Cooperation in Digital Infrastructure to Improve the Conditions for Africa's Digital Economy Development**

Using the "Digital Silk Road" as a bridge, China and Africa are seizing the opportunities presented by the joint construction of the "Belt and Road Initiative." Centered around the actual needs of African nations for digital economy development, the focus is on strengthening digital infrastructure and emphasizing the cooperative construction of associated hardware facilities. This initiative aims to elevate China-Africa cooperation in the digital infrastructure to new heights, providing a sustainable impetus for network connectivity, network security, and network efficiency, thereby improving the foundational conditions for the development of Africa's digital economy.

In terms of network connectivity, China and Africa should continue to strengthen cooperation in building digital infrastructure, comprehensively enhance construction levels, and reduce the gap in digital economy facilities across African nations from multiple dimensions. Regarding network security, both parties should leverage China's digital economy development advantages to assist African countries in establishing and improving digital technology standards. Together, China and Africa should develop network security solutions that meet local African needs, promoting the "China-AfCFTA Cooperation Initiative on Data Security". In the area of network efficiency, the parties should fully consider the stage differences in digital development among nations, address challenges such as low network coverage, high internet costs, and the divergence in internet usage faced by African countries in their digital economy development, and work to reduce the costs of network information access.

#### **4.1.3 Expanding Digital Applications to Promote the Transformation of Industrial Digitization and Digital Industrialization**

The development of Africa's digital economy is transitioning from a solid foundation of digital technology infrastructure to a broad expansion into digital applications. Centering on this shift, China and Africa are focusing on the formation and realization of digital value, actively exploring the potential of Africa's digital application market. This includes advancing sectors like digital finance, digital trade, and urban digitalization through multi-dimensional industrial digitization and digital industrial transformation.

In the field of digital finance, China and Africa should jointly build digital financial infrastructure and develop cross-border electronic payment systems to enhance the prevalence and efficiency of digital economy applications in financial services. Regarding digital consumption, both sides can further deepen cooperation on "Silk-Road E-Commerce," jointly develop e-commerce platforms, build the China-Africa E-Commerce Cooperation Park, strengthen market cultivation of African specialty products, and promote the digital transformation of China-Africa trade. In urban digitalization, the parties should collaborate to build sister cities, implement "one-to-one" support for African smart city projects and the



construction of urban data centers, push forward the modernization of African urban management, achieve data-driven decision-making, and enhance the resolve for digital cooperation between China and Africa.

#### **4.1.4 Exploring Innovative Ecosystems to Enhance Africa's Digital Economy Innovation Capacity**

The construction of "Digital Africa" has become a common development goal among African countries, evolving from digital technology infrastructure to digital application services, and further into continuous exploration in integrated innovation. China and Africa should leverage the "Digital+" empowerment to enhance the service and application capabilities of existing digital economy development cooperation projects, and collaboratively explore their innovative capacities. By establishing mechanisms and improving management systems, the China-Africa digital innovation ecosystem can be explored through deep integration of digital innovation talent cultivation and industrial development, thereby comprehensively enhancing Africa's digital economy innovation capability.

China and Africa should fully support the alignment of digital economic and trade rules between the Pilot Zone for In-depth China-Africa Economic and Trade Cooperation and the AfCFTA. They should establish close mechanisms for digital economy cooperation, jointly improve funding support mechanisms, create the China-Africa Digital Innovation Fund, and support the establishment of national and regional China-Africa digital innovation cooperation centers. This will advance the integration of digital innovation and industrial development, and ensure the alignment of China-Africa digital innovation cooperation outcomes with economic and trade cooperation results. In terms of talent innovation, both sides can jointly develop education and training programs, build an information service exchange platform for China-Africa digital cooperation, and support collaborative research and analysis on the digital economy development of African countries and cities by universities, think tanks, and enterprises from both sides. In industrial development, through joint research and development, technology transfer, and sharing of best practices by both sides, the China-Africa technology transfer and innovation cooperation network can be perfected. This includes supporting the construction of "China-Africa Digital Innovation and Economic and Trade Cooperation" joint laboratories, partner institutes, and technology innovation cooperation bases to promote cooperation in the field of artificial intelligence and drive leapfrog development of the African digital economy.

#### **4.1.5 Bridging the Digital Divide to Create an Inclusive Digital Economy Development Environment**

Under the guidance of the "Initiative on International Trade and Economic Cooperation Framework for Digital Economy and Green Development," China and Africa should closely address the challenges of a "multi-level digital divide" faced by Africa. Both sides should explore the vast potential of Africa's digital economy and jointly create an open, inclusive, fair, just, and non-discriminatory digital economy development environment. This initiative aims to promote equal participation and usage of the digital economy among African nations, urban and rural areas, and genders, achieving inclusive growth of the digital economy and jointly working to narrow the digital divide.

Through preferential trade agreements and investment support, the parties should collaborate on digital inclusion innovation projects, encourage the entry of private digital economies into the African market, further enhance the inclusiveness of China-Africa digital cooperation, and unleash the dividends of the digital economy. Furthermore, leveraging the exemplary role of the sister cities established between China and African nations, both sides should deepen the exchange of digital industry policies, fully leverage the complementary advantages between cities, support African nations in applying digital technologies to sectors vital to people's livelihoods such as transportation, healthcare, and finance, and further strengthen China-Africa "smart city" cooperation. At the same time, China and Africa should actively carry out digital vocational training programs, focus on enhancing digital skills among vulnerable groups including women, actively create local employment and development opportunities, and bridge the gender digital divide.

## 4.2. Key Areas of Cooperation and Action Suggestions

### 4.2.1 Suggestions for China-Africa Cooperation in Digital Economy of Countries Grouped into Leading-Coordination Zone

Countries grouped in leading-coordination zone include those ranked highly in the comprehensive evaluation of the digital economy and demonstrating positive coordination. Compared to other regions or countries, these nations already possess a leading edge and are key drivers of digital economic development in Africa. Suggestions for China-Africa cooperation focus on upgrading digital infrastructure, developing smart cities, fostering technology innovation, enhancing digital consumption and financial services innovation, and building digital ecosystems.

**Table 4-1 Suggestions for China-Africa Cooperation in Digital Economy of Countries Grouped into Leading-Coordination Zone**

Key Focus Areas	Cooperation Suggestions
Upgrading Digital Infrastructure and Applying Artificial Intelligence	<ul style="list-style-type: none"> <li>➤ For China, it is advisable to leverage its strengths in network construction and standards R&amp;D to accelerate the application and deployment of new infrastructure such as 5G networks and big data centers with countries in leading-coordination zone. Additionally, it can also deepen cooperation in the field of artificial intelligence.</li> <li>➤ For Africa, it should actively promote innovative cooperation with China in technologies such as cloud computing and the Internet of Things, enhancing the storage and perception components of digital infrastructure as well as integrated application capabilities.</li> </ul>
Developing Smart Cities to Leverage Central Urban Areas' Radiating Influence	<ul style="list-style-type: none"> <li>➤ For China, it is recommended to strengthen cooperation with local governments in Africa to develop smart city solutions, particularly in the fields of traffic and energy management. Additionally, China should invest in local ICT infrastructure to enhance internet and data center services, and conduct city-level data analysis and urban planning services to improve urban management and service levels.</li> </ul>

	<ul style="list-style-type: none"> <li>➤ For Africa, its governments should establish and refine data management and analysis systems to enhance the public safety system of smart cities. Additionally, they are advised to promote the use of smart transportation systems and environmental monitoring to improve urban management efficiency and quality of life. Furthermore, they should also increase investment in intelligent facilities for education and healthcare to improve service quality and coverage.</li> </ul>
<p>Promoting Technology Innovation Cooperation in the Digital Economy</p>	<ul style="list-style-type: none"> <li>➤ For China, in the realm of the digital economy, additional topics should be introduced at the China-Africa Innovation Cooperation and Development Forum to continually deepen policy exchanges and pragmatic cooperation in technological innovation. It should also continue to promote the establishment of joint laboratories between Chinese and African research institutions, forge partnerships, build several China-Africa technology innovation cooperation bases in Africa, and engage in cooperation that involves training in digital economy sciences and technology, technology demonstrations, and joint research.</li> <li>➤ For Africa, it is advisable to establish an innovation cooperation network that serves both Chinese and African innovators, covering Chinese and African research institutions, universities, and technology enterprises. Africa should also support the development of China-Africa joint laboratories and cooperative research institutes and promote innovative cooperation between both sides in the field of the digital economy.</li> </ul>
<p>Creating New Business Models in Digital Consumption to Enrich Digital Consumption Scenarios</p>	<ul style="list-style-type: none"> <li>➤ For China, it is recommended to leverage its experience in digital consumption development alongside Africa's consumption upgrading to promote bilateral digital consumption cooperation. On one hand, China should enhance the digitization level of the supply chain to better match supply and demand in digital consumption. This includes using digital technologies such as the internet and big data to collect, integrate, and analyze data, thereby establishing profiles for the African digital consumer market and target groups. On the other hand, China should innovate digital consumption development models by launching lightweight, feature-rich "super apps" tailored to local lifestyles in countries like South Africa and Kenya. Drawing on China's experience in social e-commerce, it should also introduce this model to Africa, creating a distinctive product and industry-supported social e-commerce industry chain with comprehensive service capabilities. Additionally, China should strive to build leading social e-commerce platforms in Africa and expand cooperation in emerging digital service sectors such as digital transportation, digital tourism, digital education, and digital healthcare.</li> <li>➤ For Africa, it is suggested to work with China to develop a practical and feasible bilateral digital consumption cooperation strategy and upgrade corporate support policies. It should establish a China-Africa digital consumption cooperation platform to integrate resources from both sides and precisely match supply and demand.</li> </ul>

Establishing a Digital Finance Ecosystem	<ul style="list-style-type: none"> <li>➤ For China, it is important to address the financial services needs within China-Africa trade and investment. China should utilize financial technologies, such as blockchain, to promote trade through barter or the use of the Renminbi in Africa. In alignment with the business scenarios of China-Africa cooperation in the digital economy, China should also support African data sharing, enhance the accuracy of risk assessments and credit scoring, and jointly develop a cross-industry, cross-disciplinary digital financial ecosystem with African partners.</li> <li>➤ For Africa, countries like South Africa and Kenya could introduce favorable policies to encourage partnerships with Chinese fintech companies. Together, they could develop solutions in digital payments and blockchain technology. Leveraging projects like Huawei's "Huawei ICT Academy" and "Seeds for the Future," these countries can strengthen ICT professional technical training. This would improve the digital skills and financial literacy of both enterprises and individuals in the real economy, thereby enhancing local fintech capabilities and the endogenous growth momentum of financial innovation.</li> </ul>
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#### 4.2.2 Suggestions for China-Africa Cooperation in Digital Economy of Countries Grouped into Catch-up-Coordination Zone

Nations in the catch-up and collaboration zone include those ranked mid-level in the comprehensive evaluation of the digital economy and demonstrating positive coordination. These nations possess significant potential for cooperation in digital economic development. It is recommended that China and Africa focus on improving the quality of digital infrastructure, exchanging and training digital skills talent, and deeply cooperating in areas such as digital consumption, financial markets, and the development of urban digital service scenarios.

**Table 4-2 Suggestions for China-Africa Cooperation in Digital Economy of Countries Grouped into Catch-up-Coordination Zone**

Key Focus Areas	Cooperation Suggestions
Emphasizing the Upgrading of Digital Infrastructure Quality	<ul style="list-style-type: none"> <li>➤ For China, it should actively cooperate with local governments and mobile network operators to strengthen the construction of ICT infrastructure such as 4G and 5G networks and fiber optic cables, enhance mobile network and broadband coverage, and improve data transmission speeds. It should also strengthen cooperation with African nations on network information security to jointly create a stable and reliable network environment.</li> <li>➤ For Africa, it is recommended to support the strengthening of cooperation with China in building data centers, cloud computing platforms, and initiatives that promote the widespread adoption of high-speed networks. Additionally, Africa should back the establishment of the China-Africa digital infrastructure joint research and development center. This center would focus on researching and developing customized hardware and software solutions tailored to the unique needs of the African region, thereby promoting technological innovation.</li> </ul>
Strengthen the Training of Digital Skills Talent	<ul style="list-style-type: none"> <li>➤ For China, it is crucial to establish a cooperation mechanism for digital skills training, tailored to the actual conditions and development needs of the countries in the accelerated zone. It is suggested that China conduct targeted</li> </ul>

	<p>digital skills training projects and share digital education resources. This will provide essential talent support for the digital economic development of Africa's accelerated zone countries.</p> <ul style="list-style-type: none"> <li>➤ For Africa, considering the youthful demographic structure of the accelerated zone countries is essential. It is recommended to implement cross-border digital skills internship programs to promote digital skills training, which will support African youth in deeply engaging with the China-Africa digital economy cooperation, enhancing their involvement and contribution to this growing sector.</li> </ul>
<p>Deepen Involvement in The E-commerce Sector to Solidify the Foundations of Digital Trade</p>	<ul style="list-style-type: none"> <li>➤ For China, it is advisable to tailor e-commerce cooperation closely to the unique characteristics of consumer markets in African countries and explore social e-commerce. The parties should jointly create digital consumption scenarios with African countries and foster new scenarios and business models. Additionally, China should integrate digital technology into education, healthcare, and cultural and sports events to create a new model of "Internet + social services." Furthermore, China should provide African countries with quality remote education resources and online teacher training to share high-quality educational resources and support educational reform in Africa. China should also advance China-Africa public health cooperation through online health platforms, enabling Chinese experts to conduct video conferences, online consultations, and training for African medical staff, thereby assisting in the development of digital healthcare in Africa.</li> <li>➤ For Africa, it is important to solidify the foundation for digital trade. With the official launch of the AfCFTA, Africa should accelerate negotiations related to e-commerce and digital trade. Steps should include gradually eliminating cross-border digital trade tariffs, facilitating intra-African trade, expanding e-commerce operations, and promoting the development of digital trade within the continent.</li> </ul>
<p>Enhance Cooperation in Digital Financial Services</p>	<ul style="list-style-type: none"> <li>➤ For China, collaborating with African countries to offer cross-border payment and settlement services is essential to enhance trade efficiency and reduce costs. Additionally, China should promote the development of mobile payment and electronic wallet services, providing convenient options for mobile payments, transfers, and account management through partner platforms or proprietary systems tailored to meet local user needs. Moreover, China should engage deeply with local communities to customize social financial services to local demands. This could include financing for SMEs, rural financial services, and community finance. China should also conduct digital financial literacy and skills training to enhance the knowledge and application abilities of financial professionals and users across Africa.</li> <li>➤ For Africa, it is crucial to establish a China-Africa digital finance cooperation platform or actively participate in international dialogue platforms such as the Forum on China-Africa Cooperation. By hosting digital finance forums, exhibitions, and exchange activities, Africa can build cooperative bridges, promote technology transfer, and foster project cooperation. Moreover, Africa</li> </ul>

	<p>should advance the signing of China-Africa bilateral currency swap agreements to reduce exchange rate risks and transaction costs, optimize the environment for the use of the Renminbi in Africa, and further enhance the attractiveness of cross-border Renminbi transactions.</p>
Promoting the Transformation of Urban Digital Government Services	<ul style="list-style-type: none"> <li>➤ For China, it is suggested to facilitate technology and management knowledge transfer to help African cities establish digital government service systems. China should also assist in developing data protection standards and detailed implementation guidelines to enhance data security levels across African countries. Furthermore, China should initiate digital government training programs to improve the digital skills of local government staff.</li> <li>➤ For Africa, it is crucial to strengthen the digitization of government services, such as online platforms, and simplify administrative procedures. Additionally, Africa should establish and enforce data protection laws and policies to better regulate activities related to the digital economy. It should also increase the number of digital service access points to improve connectivity in rural and remote areas.</li> </ul>

### 4.2.3 Suggestions for China-Africa Cooperation in Digital Economy of Countries Grouped into Catch-up-Adjustment Zone

Nations in the catch-up and adjustment zone include those ranked mid-level in the comprehensive evaluation of the digital economy. These nations have already been actively exploring digital economic development. However, there may be increasing disorder within their digital economy systems. In terms of cooperation, it is important to focus on the "weak links" in the evolution of their digital economy systems, concentrate on narrowing the "digital divide," enhance the effective supply of digital consumption and financial scenarios, and emphasize the inclusive value of the digital economy.

**Table 4-3 Suggestions for China-Africa Cooperation in Digital Economy of Countries Grouped into Catch-up-Adjustment Zone**

Key Focus Areas	Cooperation Suggestions
Enhancing the Construction of Digital Infrastructure	<ul style="list-style-type: none"> <li>➤ For China, it is recommended to cooperate with local governments and operators to strengthen the construction of core ICT infrastructures, such as local backbone fiber optics and 4G networks, expand the coverage of mobile networks and broadband, and narrow the local digital divide.</li> <li>➤ For Africa, it is important to focus on addressing the "weak links" in digital innovation and the mismatch between digital infrastructure and digital applications. Additionally, Africa should collaborate with China on projects that foster inclusive digital innovation, support the research and development of low-cost digital technologies, and enhance the accessibility, affordability, and applicability of digital infrastructure in Africa.</li> </ul>
Improving Conditions for Digital Consumption and Optimizing the Digital	<ul style="list-style-type: none"> <li>➤ For China, it is advisable to support infrastructure development in African countries by actively promoting the advancement of transportation and networks. China should encourage companies like Alibaba and Kilimall to provide e-commerce training to local SMEs in Africa. This includes offering</li> </ul>

<p>Consumption Environment</p>	<p>guidance on e-commerce operations, helping traditional consumer goods manufacturers transition to online channels for direct sales, and developing digital consumption scenarios tailored to local conditions. For instance, in countries like Niger and Lesotho, it would be beneficial to launch puzzle game applications that are memory-efficient, use minimal data, and are lightweight.</p> <p>➤ For Africa, it should improve the infrastructure for digital consumption and increase the penetration of smartphones. It also should strengthen the construction of logistics infrastructure such as roads and railways and accelerate the development of logistics methods like courier services. Moreover, Africa should develop and implement strategies for digital consumption growth, enhance support and investment in digital consumption, and encourage African companies to collaborate with Chinese firms in applying digital technologies across production, operation, and sales processes.</p>
<p>Strengthening Urban Wi-Fi Coverage Business Cooperation and Focusing on Inclusive Network Services</p>	<p>➤ For China, it is suggested to collaborate with local governments in Africa to provide customized internet solutions tailored to regional needs, such as developing low-cost Wi-Fi access technologies suitable for the African market. Additionally, China should establish or support local technology training centers to enhance the skills and operational capabilities of local technicians in network technologies.</p> <p>➤ For Africa, it is essential to promote sustainable internet access models, such as small, distributed Wi-Fi network nodes powered by renewable energy sources like solar power, especially in remote areas. Additionally, Africa should launch digital skills training programs for both youth and adults to enhance their information technology capabilities.</p>
<p>Enhancing Cooperation in Technologies such as Electronic Banking and Smart Payments to Increase the Inclusiveness of Digital Finance</p>	<p>➤ For China, it is possible to enhance the system construction and technical support for financial services such as mobile payments and electronic banking for these countries. Using China's financial technology expertise, it can rapidly establish digital wallets for African residents that provide financial-grade reliability and stability. Jointly, China and Africa should tackle cross-border financial crimes and cybersecurity threats, promote the development of digital financial regulatory systems, and improve the support capacity and security of digital financial services.</p> <p>➤ For Africa, African enterprises should actively seek Chinese partners in the digital finance sector to establish long-term and stable cooperative relationships in technology cooperation, talent training, and market expansion. This collaboration should aim to drive the digital upgrade of enterprises from areas such as digital payments, e-commerce, and financial technology. Additionally, African enterprises should pursue cooperation with Chinese investors or financial institutions to secure financing and investment support. They should also focus on post-service operations and maintain a favorable investment environment to promote the digital development and expansion of enterprises.</p>

## Annex

### a. Summary of the report in French

L'économie numérique devient un moteur essentiel de la croissance économique mondiale et joue un rôle important dans l'accélération de la reprise économique, l'augmentation de la productivité du travail dans les industries existantes, la promotion de nouveaux marchés et de nouveaux pôles de croissance industrielle, et la réalisation d'une croissance inclusive et durable. Connue comme le « continent le plus jeune », l'Afrique dispose d'un grand potentiel de développement de l'économie numérique et s'accélère aujourd'hui dans ce sens-là. Pour les pays africains, le développement de l'économie numérique est une initiative importante pour parvenir à un développement économique et social durable, diversifié et inclusif. Cependant, en raison de contraintes géographiques, sociales et culturelles, il existe d'évidentes disparités au niveau régional et communautaire en Afrique dans l'utilisation et l'accès à la technologie numérique, et ce déséquilibre ne doit pas être ignoré, et la tâche de combler ce fossé reste urgente.

La Chine a accompli des progrès remarquables dans le développement de son économie numérique, qui s'est classée au deuxième rang mondial depuis de nombreuses années consécutives. Elle a ainsi accumulé de riches expériences dans la réduction de la fracture numérique et la promotion de la transition numérique industrielle. Le secrétaire général M. Xi Jinping a exprimé à plusieurs reprises sa volonté de renforcer les échanges et la coopération avec d'autres pays dans le domaine numérique et de partager les opportunités de développement de l'économie numérique. Afin de répondre à la vague de numérisation et de libérer l'énorme potentiel de l'économie numérique dans le cadre de la mise en œuvre du programme de développement durable à l'horizon 2030, l'initiative « la Ceinture et la Route » a fait de la promotion de la connectivité numérique une orientation importante.

Ces dernières années, la coopération pragmatique Chine-Afrique dans l'économie numérique a obtenu des résultats remarquables en comblant le fossé numérique entre le Nord et le Sud et en résolvant la « pauvreté numérique », ce qui a créé de nouvelles opportunités pour les deux parties de réaliser une croissance économique inclusive et une transformation numérique. Lors de la 8e Conférence ministérielle du Forum sur la coopération sino-africaine (FOCAC) tenue à Dakar, au Sénégal, en novembre 2021, le « programme d'innovation numérique » a été inscrit comme l'un des « neuf programmes » devant être mis en œuvre conjointement par la Chine et l'Afrique. En octobre 2023, lors du 3e Forum de la Ceinture et de la Route pour la coopération internationale, la Chine et un certain nombre de pays en développement, dont le Kenya et l'Éthiopie, ont publié ensemble l'*Initiative de Beijing sur la coopération internationale en matière d'économie numérique de « la Ceinture et la Route »*. Autour du thème « développer l'économie numérique et explorer du nouveau dynamisme pour la croissance économique », 20 consensus<sup>1</sup> ont été atteints sur le renforcement de la connectivité numérique et la construction

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<sup>1</sup> Forum de haut niveau sur l'économie numérique dans le cadre du 3e Forum de la Ceinture et de la Route pour la coopération internationale, Initiative de Beijing sur la coopération internationale en matière d'économie numérique de « la Ceinture et la Route » <http://lu.china-embassy.gov.cn/chn/zgyw/202310/P020231019680044766978.pdf>



d'une route de la soie numérique dans les infrastructures, la transition industrielle, la capacité numérique, le mécanisme de coopération, etc. L'économie numérique est devenue un domaine important de la coopération gagnant-gagnant entre la Chine et l'Afrique.

## **But et objectifs**

Ce rapport, soutenu par le Département provincial du commerce du Guangdong, est publié conjointement par le CAETI et le laboratoire de Big Data et d'IA de datasparkle, dont les principaux auteurs sont issus de l'Université du Hunan. Il vise à analyser les domaines clés de la coopération Chine-Afrique en économie numérique en étudiant les caractéristiques générales et l'état de développement de ce secteur en Afrique, et à formuler des propositions au niveau national et des entreprises, de manière à promouvoir une coopération gagnant-gagnant dans le développement de l'économie numérique.

## **Contenu principal**

Dans le Rapport sur l'Indice de développement de l'économie numérique et la coopération sino-africaine en matière d'économie numérique (2024), nous avons observé et analysé systématiquement les caractéristiques du développement de l'économie numérique en Afrique, et ont exploré la situation actuelle et la voie de la coopération sino-africaine en cette matière. Le Rapport est divisé en quatre chapitres :

### **Chapitre I : Indice de développement de l'économie numérique en Afrique**

Un cadre d'évaluation multidimensionnelle de l'économie numérique « espace-multidomaines-temps » a été systématiquement développé, et une description exhaustive des caractéristiques du développement de l'économie numérique en Afrique a été dressée grâce au système d'indices composites et au modèle de synergie systématique. Sur la base des résultats de l'analyse mathématique, a été menée une analyse sur la fracture numérique à plusieurs niveaux, la synergie de l'évolution de l'économie numérique, le développement de la finance numérique et du marché de la consommation numérique, ainsi que les caractéristiques du développement de l'économie numérique au niveau des villes en Afrique.

### **Chapitre II Coopération Chine-Afrique dans l'économie numérique**

Sur la base de l'historique de la coopération sino-africaine dans l'économie numérique, nous avons résumé dans ce chapitre les réalisations et les défis de cette coopération, en citant des cas tels que le CADFUND et TRANSSION pour montrer sa profondeur et son étendue.

### **Chapitre III : Développement de l'économie numérique au Kenya et Coopération Chine-Kenya dans l'économie numérique**

Nous avons résumé la situation actuelle et les caractéristiques du développement de l'économie numérique du Kenya, et avons démêlé l'histoire de sa coopération avec la Chine sur ce sujet. Des cas comme les services localisés de Kilimall au Kenya et la collaboration entre Huawei et M-Pesa en faveur du développement de la finance inclusive en Afrique ont été cités pour mettre en évidence les fruits importants de la coopération numérique Chine-Kenya.

## **Chapitre IV : Suggestions pour la coopération sino-africaine dans l'économie numérique**

Sur la base de l'évaluation globale de l'économie numérique des pays africains, nous avons divisé les pays en catégories différentes en fonction de leur développement numérique, prévu les enjeux de la coopération Chine-Afrique en cette matière, envisagé les perspectives macro de coopération au niveau national et de l'entreprise et formulé des suggestions liées à l'action.

### **Approche et méthodologie**

Nous avons recueilli des informations et des données faisant autorité auprès de diverses sources et tiré des conclusions en recourant à l'analyse documentaire, à l'évaluation de l'indice composite et à l'étude de cas. La littérature comprend des documents politiques, des documents de recherche et des informations provenant de professionnels du secteur, d'institutions de renom et d'organisations financières multilatérales et régionales ; les données macroéconomiques des institutions officielles telles que la Banque mondiale, le Fonds monétaire international et l'Organisation internationale du travail ont été utilisées pour la construction de l'indice composite alors que les données microéconomiques proviennent de DataSparkle; Les informations sur les entreprises incluses dans le rapport sont essentiellement les informations publiques du CABR et du CADFUND, et ces entreprises sélectionnées bénéficient d'une certaine popularité dans la coopération économique numérique entre la Chine et l'Afrique, d'où une forte représentativité.

### **Points de vue et Conclusions**

#### **Caractéristiques du développement de l'économie numérique en Afrique**

- Le potentiel de développement global de l'économie numérique de l'Afrique est vaste, mais il existe des disparités régionales significatives, et ce déséquilibre systémique et cette fracture numérique « à plusieurs niveaux » devraient être source d'inquiétude.
- En ce qui concerne la finance numérique, les pays africains ont des niveaux de développement différents et certains d'entre eux présentent des disparités dans le développement des différentes dimensions de la finance numérique, d'où un grand potentiel de croissance. La finance traditionnelle est le fondement du développement de la finance numérique en Afrique, tandis que la fintech est le moteur de leur transformation.
- À propos de la consommation numérique, la capacité des scénarios est devenue le principal moteur du développement en Afrique sur ce sujet. À signaler que les jeux récréatifs et les médias sociaux sont devenus des applications populaires.
- Lors de la numérisation urbaine, Lagos et Le Caire sont en tête des grandes villes africaines en termes d'utilisateurs de smartphones ; les applications mobiles pour l'éducation gagnent de plus en plus du terrain ; et le trafic de données reste le moyen le plus populaire d'utiliser le trafic du réseau mobile par rapport au Wi-Fi.
- Sur la base de l'évaluation globale du développement de l'économie numérique en Afrique, nous avons divisé les pays sélectionnés en catégories différentes, à savoir « leader et synergie », « rattrapage et synergie » et « rattrapage et adaptation ».

## **Coopération entre la Chine et l’Afrique dans l’économie numérique**

- La Chine et l’Afrique ont lancé une coopération globale dans les domaines des infrastructures numériques, des applications numériques et de l’innovation en matière de technologie numérique, et ont désormais franchi des étapes importantes, démontrant pleinement le grand potentiel et la vitalité de la Coopération Sud-Sud.
- Au cours de la nouvelle phase de développement, la Chine devrait continuer à prêter attention à la capacité de développement indépendant de l’économie numérique de l’Afrique, accorder une attention particulière aux aspirations des pays africains à différents niveaux de développement de l’économie numérique, et promouvoir la coopération échelonnée avec eux en cette matière.

## **Recommandations politiques**

En analysant le développement de l’économie numérique en Afrique et en examinant l’état actuel de la coopération Chine-Afrique, nous avons formulé les perspectives de coopération dans l’économie numérique sous deux aspects : orientations macroéconomiques et recommandations sur l’action :

Concernant l’orientation macroéconomique, il est conseillé de prendre de mesures suivantes : renforcer la conception de haut niveau et approfondir la coopération en économie numérique ; consolider la coopération relative aux infrastructures numériques et améliorer les conditions de développement numérique africaine ; étendre les applications numériques, promouvoir la numérisation industrielle et la transformation numérique ; explorer les écosystèmes d’innovation et renforcer la capacité d’innovation de l’économie numérique africaine ; combler le fossé numérique et construire un environnement inclusif pour le développement de l’économie numérique.

Quant aux actions concrètes, les suggestions sont formulées en fonction du type du pays : la collaboration avec les pays « leader et synergie » devrait se concentrer sur la mise à niveau des infrastructures numériques, les villes intelligentes, l’innovation technologique, l’innovation dans la consommation et la finance numériques, et la création d’écosystèmes ; la coopération avec les pays en phase de rattrapage-synergie devrait être axée sur l’amélioration de la qualité des infrastructures numériques, l’échange et la formation de talents, et le développement du marché de la consommation, de la finance numériques ainsi que des scènes de services numériques urbains ; le travail avec les pays en phase de rattrapage-adaptation devrait se focaliser sur les faiblesses de l’évolution de leurs systèmes économiques numériques, la réduction de la fracture numérique, l’amélioration de l’offre effective de consommation numérique et de scénarios financiers, et la valeur universelle de l’économie numérique.

## **b. Summary of the report in Portuguese**

A economia digital está a tornar-se um motor essencial do crescimento económico mundial e desempenha um papel fundamental na aceleração da recuperação económica, no aumento da produtividade do trabalho nas indústrias existentes, na promoção de novos mercados e de novos pontos de crescimento nas indústrias e na obtenção de um crescimento inclusivo e sustentável.

A África é conhecida como o "continente mais jovem" e tem um grande potencial para o desenvolvimento económico digital. A África de hoje está a avançar em termos digitais e os países africanos tomaram o desenvolvimento da economia digital como uma iniciativa importante para alcançar um desenvolvimento económico e social sustentável, diversificado e inclusivo. Mas, ao mesmo tempo, devido a condicionalismos geográficos, sociais e culturais, existem diferenças óbvias na utilização e no acesso à tecnologia digital entre as diferentes regiões e grupos em África, pelo que o problema do desenvolvimento desequilibrado da economia digital não deve ser ignorado e a tarefa de colmatar o fosso do desenvolvimento digital continua a ser urgente.

A China alcançou resultados notáveis no desenvolvimento da sua economia digital, que se classificou em segundo lugar no mundo durante muitos anos consecutivos, e acumulou uma grande experiência na redução do fosso digital e na promoção da transformação digital das indústrias. O presidente chinês Xi Jinping manifestou repetidamente a sua vontade de reforçar os intercâmbios e a cooperação com outros países no domínio digital e de partilhar as oportunidades de desenvolvimento da economia digital. A fim de responder à onda de digitalização e libertar o enorme potencial da economia digital na implementação da Agenda 2030 das Nações Unidas para o Desenvolvimento Sustentável, a Iniciativa "Uma Faixa, Uma Rota" assumiu a promoção da conectividade digital como uma direção importante.

Nos últimos anos, a cooperação prática China-África na economia digital alcançou resultados notáveis na redução do fosso digital Norte-Sul e na abordagem da "pobreza digital", criando novas oportunidades para ambas as partes alcançarem um crescimento económico inclusivo e uma transformação digital. Na 8ª Conferência Ministerial do Fórum de Cooperação China-África (FOCAC, na sigla em inglês), realizada em novembro de 2021 em Dacar, Senegal, foi lançado o "Projeto de Inovação Digital" (DIP, na sigla em inglês). "O "Projeto de Inovação Digital" foi listado como um dos nove projetos a serem implementados em conjunto pela China e África. Em outubro de 2023, durante o 3º Fórum Faixa e Rota para Cooperação Internacional, a China e vários países em desenvolvimento, incluindo o Quênia e a Etiópia, lançaram conjuntamente a Iniciativa de Beijing "Uma Faixa, Uma Rota" para a Cooperação Internacional sobre Economia Digital. Centrada no tema "Desenvolver a economia digital e aproveitar a nova energia dinâmica para o crescimento económico", a conferência chegou a 20 pontos de consenso sobre "Reforçar a conectividade digital e construir a Rota da Seda Digital" nas áreas de "Infra-estruturas, Transformação Industrial, Capacidades Digitais e Mecanismos de Cooperação"<sup>1</sup>. "A economia digital tornou-se uma importante área de cooperação vantajosa para ambas as partes entre a China e África.

## **Finalidade e objetivos**

Este relatório é apoiado pelo Departamento de Comércio da Província de Hunan e publicado conjuntamente pelo Instituto de Investigação para a Cooperação Económica e Comercial China-África e pelo Laboratório de Big Data e Inteligência Artificial da datasparkle, com os principais autores da Universidade de Hunan. O objetivo é estudar as características gerais e o

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<sup>1</sup> Fórum de Alto Nível sobre a Economia Digital do 3º Fórum Faixa e Rota para Cooperação Internacional, Iniciativa de Beijing "Uma Faixa, Uma Rota" para a Cooperação Internacional sobre Economia Digital, <http://lu.china-embassy.gov.cn/chn/zgyw/202310/P020231019680044766978.pdf>.

estado de desenvolvimento da economia digital em África, analisar as áreas-chave da cooperação China-África em matéria de economia digital e apresentar propostas de cooperação a nível nacional e empresarial, de modo a promover situações vantajosas para ambas as partes no desenvolvimento da economia digital.

## **Enquadramento do conteúdo**

Centrando-se no tema do desenvolvimento da economia digital em África e da cooperação China-África no domínio da economia digital, o relatório "Índice de Desenvolvimento da Economia Digital e Relatório de Cooperação China-África no domínio da Economia Digital (2024)" observam e analisam sistematicamente as características do desenvolvimento da economia digital em África e exploram a situação atual e o caminho da cooperação China-África no domínio digital. O relatório está especificamente dividido em quatro capítulos:

### **Capítulo 1: Índice de desenvolvimento da economia digital em África**

Construímos sistematicamente um quadro de avaliação da economia digital multidimensional de "espaço-multi-domínio-tempo" e descrevemos de forma abrangente as características do desenvolvimento da economia digital de África através de um sistema de índice abrangente e de um modelo de sinergia sistemático. Com base nos resultados da análise matemática, analisamos também o fosso digital a vários níveis em África, a sinergia da evolução da economia digital em África, o desenvolvimento das finanças digitais e do mercado de consumo digital em África e as características do desenvolvimento da economia digital ao nível das cidades em África.

### **Capítulo 2 Cooperação China-África no domínio da economia digital**

Com base na história da cooperação China-África no domínio da economia digital, resume as realizações e os desafios da cooperação China-África no domínio da economia digital, citando casos de empresas como o Fundo de Desenvolvimento China-África e a Shenzhen Transfar Holding Co. para mostrar a profundidade e a amplitude da cooperação China-África no domínio da economia digital em vários campos.

### **Capítulo 3: Desenvolvimento da economia digital no Quênia e cooperação China-Quênia no domínio da economia digital**

Resume a situação atual e as características do desenvolvimento da economia digital no Quênia, compreende a história da cooperação China-Quênia no domínio da economia digital e demonstra os resultados importantes da cooperação digital China-Quênia, resumindo casos como os serviços localizados da Kilimall no Quênia e a assistência da Huawei ao desenvolvimento de finanças inclusivas em África, juntamente com o M-Pesa.

### **Capítulo 4: Sugestões para a cooperação China-África no domínio da economia digital**

Com base nos resultados da avaliação exaustiva da economia digital dos países africanos, é caracterizado o desenvolvimento da economia digital dos países africanos, é julgado o foco da cooperação China-África em matéria de economia digital, e é feita uma perspetiva da macro-

roda da cooperação China-África em matéria de economia digital a nível nacional e empresarial, e serão apresentadas propostas de ação.

## **Abordagem e metodologia**

O compilador deste relatório recolhe informações e dados fidedignos de várias fontes e recorre à análise da literatura, à avaliação de índices abrangentes e à análise de estudos de caso para tirar conclusões relevantes. A informação utilizada na análise da literatura inclui, mas não se limita a, documentos de política, documentos de investigação e informação de participantes da indústria, instituições bem conhecidas e organizações financeiras multilaterais e regionais; os dados macro utilizados na construção do índice composto provêm de instituições oficiais como o Banco Mundial, o Fundo Monetário Internacional e a Organização Internacional do Trabalho, e os microdados provêm da base de dados DataSparkle; a informação sobre empresas incluída no relatório provêm principalmente da Câmara de Comércio Privada China-África, da Associação de Desenvolvimento China-África e da Associação de Desenvolvimento China-África. As informações sobre as empresas incluídas no relatório provêm principalmente da Câmara de Comércio Civil China-África, do Fundo de Desenvolvimento China-África e de informações públicas relevantes, e as empresas seleccionadas têm um certo grau de popularidade no domínio da cooperação China-África em matéria de economia digital, o que é altamente representativo.

## **Conclusão**

### **Características do desenvolvimento da economia digital em África**

- potencial global de desenvolvimento da economia digital em África é vasto, mas existem diferenças significativas de desenvolvimento entre as regiões, e o seu desequilíbrio sistémico e o fosso digital "multinível" devem ser motivo de preocupação.
- Em termos de finanças digitais, os países africanos têm diferentes níveis de desenvolvimento, e alguns países apresentam desfasamentos no desenvolvimento de diferentes dimensões das finanças digitais, o que revela um grande potencial de crescimento. As finanças tradicionais são a base para o desenvolvimento do financiamento digital em África, enquanto a fintech é a principal força que impulsiona a transformação.
- Relativamente ao consumo digital, a capacidade dos cenários do mesmo tornou-se o principal motor do desenvolvimento do consumo digital em África, onde os jogos recreativos e as redes sociais se tornaram aplicações populares.
- Em termos de digitalização urbana, Lagos e o Cairo são os "líderes" dos utilizadores de smartphones nas principais cidades africanas; as aplicações móveis educativas estão a ganhar força; e o tráfego de dados continua a ser a forma mais popular de utilização do tráfego da rede móvel em comparação com o Wi-Fi.
- Com base nos resultados da avaliação exaustiva do desenvolvimento da economia digital em África, considera-se que a amostra de países do relatório pode ser classificada como países "líderes-sinérgicos", "perseguidores-sinérgicos" e "perseguidores-ajustados" na economia digital.

### **Cooperação China-África no domínio da economia digital**

- A China e a África lançaram uma cooperação abrangente nos domínios das infra-estruturas digitais, das aplicações digitais e da inovação tecnológica digital, tendo agora alcançado marcos importantes, demonstrando plenamente o grande potencial e a vitalidade da "cooperação Sul-Sul".
- Na nova fase de desenvolvimento, a China deve continuar a prestar atenção à capacidade de desenvolvimento independente da economia digital de África, prestar uma atenção profunda às aspirações dos países africanos em diferentes níveis de desenvolvimento da economia digital e promover a cooperação no domínio da economia digital por gradiente nesta base.

### **Recomendações políticas**

O relatório analisa o desenvolvimento da economia digital em África e discute o estado atual da cooperação entre a China e a África, e perspetiva a cooperação China-África no domínio da economia digital em termos de macro-direção e de recomendações específicas de ação:

Em relação a macro-direção, recomenda-se que a China e a África reforcem a conceção de alto nível e aprofundem o espaço para a cooperação da economia digital; consolidem a cooperação em matéria de infra-estruturas digitais e melhorem as condições para o desenvolvimento da economia digital de África; expandam as aplicações digitais e promovam a digitalização industrial e a transformação da industrialização digital; explorem os ecossistemas de inovação e reforcem a capacidade de inovação da economia digital de África; e colmatem o fosso digital e criem um ambiente inclusivo para o desenvolvimento da economia digital.

Em relação a recomendações específicas de ação, acredita-se que a cooperação com os países "líderes-sinérgicos" da economia digital em África deve centrar-se na modernização das infra-estruturas digitais, nas cidades inteligentes, na cooperação em inovação científica e tecnológica, no consumo digital, na inovação da indústria financeira e na criação de ecossistemas"; a cooperação com os países "perseguidores-sinérgicos" deve centrar-se na melhoria da qualidade da infraestrutura digital, no intercâmbio e na formação de talentos em competências digitais e no desenvolvimento de cenários de consumo digital, mercados financeiros e serviços digitais urbanos"; a cooperação com os países "perseguidores-ajustados" deve centrar-se nas "deficiências" da evolução dos seus sistemas económicos digitais, na redução do "fosso digital", na melhoria da oferta efectiva de cenários financeiros e de consumo digital e no valor universal da economia digital.

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