

“Identification of digital training and employability needs, and analysis of women's presence in the technology sector in Ghana”



Prepared by IBC Spain Consultoría y Formación, SL



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1. Introduction

1.1. Context of the report and objectives

AFRICANTECH is an international cooperation project co-financed by ERDF (INTERREG MAC Territorial Cooperation Programme), whose main objective is to improve the competitiveness of both Canarian and African small and medium-sized enterprises, strengthening their capacities in innovation and digitalisation, and contributing to the economic, social and institutional development in both regions.

The initiative gives continuity to the activities carried out in recent years by the ConfiAfri consortium in the field of internationalisation, extending to the countries participating in the INTERREG MAC 2021-2027 programme. It also incorporates new objectives aimed at addressing emerging challenges in a global context marked by accelerated digital transformation, process automation and the need to promote the development of technological skills in the business fabric.

In this context, FEMETE, in collaboration with the programme partners, has committed to produce a detailed report on the identification of digital skills and employability needs in Ghana in the technology sector. This report aims to provide an accurate diagnosis of the digital skills required, existing gaps and opportunities for improvement to align workforce training with the demands of the digital economy in Ghana.

Digitalisation has become a determining factor for global socio-economic development, highlighting the crucial role of information and communication technologies (ICT) in generating employment opportunities and business competitiveness. In this context, Ghana faces the need to adapt its workforce to the demands of the digital market. Digital skills, understood as the acquisition of key competencies in areas such as data analytics, software development, cybersecurity and process automation, are essential to boosting the country's employability and sustainable growth.

This report aims to analyse in depth the digital skills and employability needs in Ghana by identifying the priority areas of training to boost the competitiveness of companies and the labour inclusion of the population. Through a methodological approach based on field studies, surveys and interviews with key stakeholders in the technology sector,

the report will seek to identify gaps between the skills available and those required by businesses, with the aim of formulating practical and sustainable recommendations.

In recent years, the expansion of ICTs has driven global economic growth; however, their adoption has been uneven, resulting in the so-called "digital divide", which reflects the disparity between countries with access to advanced technologies and those that still face challenges in their implementation. In the case of Ghana, according to ITU figures, in 2023 - the most recent year - it had 19.1 million internet subscribers and 33.4 million mobile subscribers. Considering that the country has a population of about 33.78 million in 2023 - according to the most recent World Bank data - internet penetration and mobile phone usage is high, indicating that the use of both devices is entrenched in the country.

One of the biggest challenges facing Ghana is the lack of accessible training programmes aligned with the real needs of the digital labour market. Insufficient tailored educational provision, coupled with difficulties in accessing technological resources and low awareness in some business sectors of the importance of digital transformation, represent key barriers that need to be addressed in a structured manner.

The central objective of this study is to identify the main digital skills gaps in Ghana and propose concrete strategies to strengthen the technological skills of the workforce. This will be done by analysing data obtained through surveys and interviews with companies and employees in the technology sector, as well as by reviewing previous reports on the level of digitalisation in the country. It will also consider structural factors such as the available technological infrastructure and existing public policies that influence ICT adoption.

The report will also identify employability opportunities in emerging sectors such as e-commerce, fintech and technologies applied to traditional sectors such as agriculture and manufacturing. Although there are already government and private initiatives to boost digitisation in the country, they remain limited in scope compared to market needs, making the formulation of broader and more inclusive strategies imperative.

Ultimately, this report seeks to lay the groundwork for the design of policies and training programmes to boost the development of digital skills in Ghana, identifying success stories and good practices that can serve as a reference for the implementation of effective solutions. The ultimate goal is to

promote a more competitive and inclusive work environment, where digital skills play a central role in the economic and social transformation of the country. With this approach, it is hoped that Ghana will not only close its internal digital divide, but also position itself as a relevant player in the digital economy at the regional and international levels.

Definition of the ICT sector

The sector known as ICT, or Information and Communication Technologies, encompasses a broad set of manufacturing and service industries whose main activity is related to the development, production, marketing and intensive use of information and communication technologies. This sector includes a variety of activities that can be classified into different categories according to the Spanish National Classification of Economic Activities (CNAE 2009).

Manufacturing industries:

- Manufacture of electronic components (CNAE 2611).
- Manufacture of assembled printed circuits (CNAE 2612).
- Manufacture of computers and peripheral equipment (CNAE 2620).
- Manufacture of telecommunications equipment (NACE 2630).
- Manufacture of consumer electronic products (CNAE 2640).
- Manufacture of magnetic and optical media (CNAE 2680).

Services:

- Wholesale trade of computers, peripheral equipment and computer software (CNAE 4651), as well as electronic and telecommunications equipment (CNAE 4652).
- Publishing of video games (CNAE 5821) and other computer software (CNAE 5829).
- Telecommunications by cable (CNAE 6110), wireless (CNAE 6120), satellite (CNAE 6130) and other related activities (CNAE 6190). Computer programming activities (CNAE 6201), computer consultancy (CNAE 6202), computer resource management (CNAE 6203) and other services related to information technology (CNAE 6209).
- Data processing, web hosting and related activities (CNAE 6311) and web portals (CNAE 6312).
- Repair of computers and peripheral equipment (CNAE 9511) and communication equipment (CNAE 9512).

1.2. Executive summary

Ghana is making determined progress in its transition to a digital economy, consolidating its position as one of West Africa's emerging technology markets. In recent years, expanding connectivity, the rise of digital commerce and the growth of the fintech ecosystem have transformed the country's economic landscape. However, a lack of digital skills and a disconnect between education provision and market needs limit the potential of this development. While digitalisation is creating new job opportunities, the shortage of talent with advanced technological skills prevents many companies from finding the right profiles to sustain their growth.

Government initiatives have sought to address this challenge with programmes such as the Ghana Digital Economy Policy and Strategy and the Ghana Digital Acceleration Project, which seek to modernise ICT training and extend internet coverage throughout the country. Despite these efforts, the digital divide remains a reality, especially in rural areas where access to training remains limited. Technical and vocational education and training (TVET) has improved in recent years, but is still far from meeting the growing demand for skills in artificial intelligence, cybersecurity, data analytics and software development.

Ghana's labour market reflects a structural mismatch. While technology companies and other strategic sectors seek talent with specialised training, most graduates from universities and training centres lack the practical skills needed to integrate into the digital environment. The lack of internship programmes, poor contact between the private sector and academic institutions, and the migration of highly skilled professionals to international markets exacerbate this situation.

To fully exploit the potential of digitalisation, Ghana needs a more ambitious and coordinated approach. Modernising technology curricula, creating practical training programmes aligned with the needs of the productive sector and strengthening public-private partnerships are essential steps to bridge the digital skills gap. In addition, the expansion of online education platforms and the implementation of incentives for talent retention can contribute to consolidating a more prepared and competitive workforce.

The country is at a turning point. With a comprehensive training strategy that combines education, technology, and innovation, Ghana has the opportunity to become a digital leader in the region. The key to success will lie in its ability to adapt its education system to market demands, create a dynamic innovation ecosystem, and ensure that digitalisation is a real driver of economic and social development.

2. Economic and technological context

2.1. African context

Africa has shown signs of recovery from global challenges, with the African Development Bank predicting that real GDP will grow by 4.5% by 2025. This growth is being driven by the expansion of the services sector, foreign direct investment and an increase in exports of natural resources, particularly hydrocarbons and minerals. Oil and gas production is expanding, and sectors such as mining continue to be key drivers of growth in several African economies. Structural reforms and the implementation of the African Continental Free Trade Area (AfCFTA) stand out as key elements for economic momentum.

Despite the optimistic growth figures, some significant challenges remain. In particular, inflation in several African economies has remained high, ranging between 6% and 20% in some cases, due to rising food and energy prices, exacerbated by the war between Russia and Ukraine. Debt levels also remain a concern in several countries, with public debt to GDP ratios ranging between 40% and 100%, and in some cases exceeding this threshold, as in Eritrea, where debt exceeds 160% of GDP.

Table 1: Main economic indicators of the main West African economies. Source: own elaboration based on the latest available data from the World Bank and the African Development Bank.

Country	GDP growth (%)	Population (millions)	Income per capita (USD)	Inflation rate (%)	Unemployment rate (%)
Nigeria	3,4	228,9	1.596	24,7	3,1
Senegal	10,2	18,6	1.706	10	2,5
Côte Ivory Coast	7	31,8	2.530	4,4	2,3
Ghana	4,3	34,1	2.260	38,1	3,1
Burkina Faso	6	23,6	882,7	0,7	5,3
Mali	5,3	24,2	869,3	2,1	3
Benin	6,2	14,4	1.394	2,7	1,7
Togo	6	9,5	985,7	8	1,9
Sierra Leone	5,2	8,7	757,9	47,6	3,2
Gambia	5,8	2,8	888,2	17	6,5

West Africa is one of the most dynamic sub-regions in terms of economic growth, with projections pointing to GDP growth of 6% or more in countries such as Côte d'Ivoire, Benin, Senegal and Togo by 2025. In the case of Ghana, the economy is expected to grow by 4.3% in 2025, driven by industry and services, private consumption and investment.

Inflation in West Africa has ranged between 5% and 10% in most countries in the region, driven by rising food prices, with significant variations among import- dependent economies.

In addition, the current account deficit remains a challenge for several countries in the region. In Ghana, the government expects the current account deficit to remain around 7% of GDP in 2025, while in Nigeria, the region's largest oil producer, the government expects the deficit to reach 3.87% of GDP by 2025.

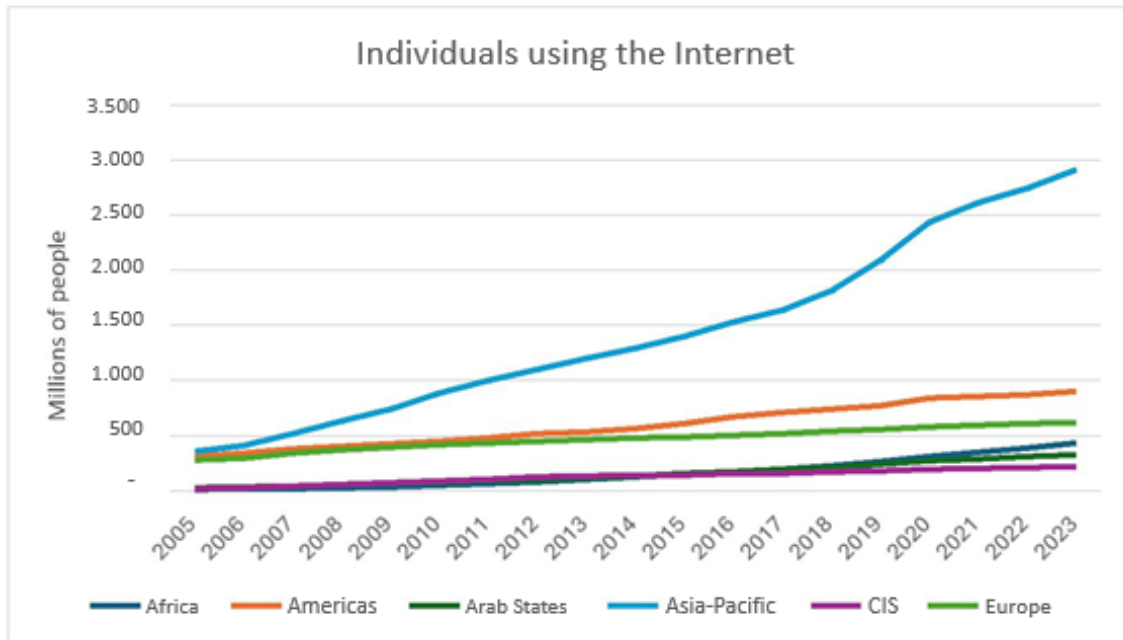
In terms of the digitisation of the African continent, we start with an analysis of data from the International Telecommunication Union (ITU), an agency of the United Nations. According to its latest report on digital development in 2024, the following picture emerges of Africa compared to other regions:

- Internet connectivity and usage: Africa continues to lag behind other regions in terms of internet access. Only 37% of the African population

uses the internet in 2023, compared to a global average of 67%. In contrast, in Europe and the Commonwealth of Independent States (CIS) region, more than 90% of the population is online, approaching universal connectivity. The difference in access between urban and rural areas is also considerable in Africa, where 57% of urban dwellers use the Internet compared to 23% of rural dwellers, reflecting a digital divide that is 2.5 times greater between these two groups. This divide is significantly deeper in Africa than in other regions of the world.

- **Mobile network coverage:** Mobile network coverage also shows significant differences between Africa and other regions. While 95% of the world's population has access to mobile broadband networks, in Africa 4G coverage reaches only 43% of the population, and 5G covers less than 10%. This puts Africa far behind Europe, where 68% of the population has access to 5G networks. The majority of the African population still relies on 3G networks, which are often the only technology available in various parts of the continent.
- **Accessibility to ICT services:** The cost of telecommunications services remains a significant barrier in Africa. The price of a mobile broadband basket (2GB) represents 4.9% of gross national income (GNI) per capita in Africa, while globally this value is 1.3%. For fixed broadband, the cost in Africa is even higher at 14.8% of GNI per capita, making mass adoption difficult. These figures reflect that although ICT services have become more affordable in recent years, Africa faces a huge cost barrier compared to regions such as Europe, where the cost of fixed broadband is only 1.0% of GNI per capita.
- **Gender gap in digital access:** Internet access continues to show significant gender disparities in Africa, with only 32% of women using the Internet, compared to 42% of men. While this gender gap is significant in Africa, it is also a global concern, with a 5 percentage point difference between men and women worldwide. However, in regions such as Europe and the Americas, gender parity in internet use is much closer to being achieved.
- **Mobile and broadband subscriptions:** In terms of mobile broadband subscription penetration, Africa has 48 active subscriptions per 100 inhabitants, which is much lower than the global average of 116 subscriptions. This low level of subscriptions reflects both coverage challenges and cost issues, and contrasts sharply with more advanced regions, such as the Americas and Europe, where mobile broadband penetration is more than double. By 2024, has achieved 96% coverage for basic mobile networks and 68% for 4G networks, ranking it among the countries with the highest coverage in West Africa.

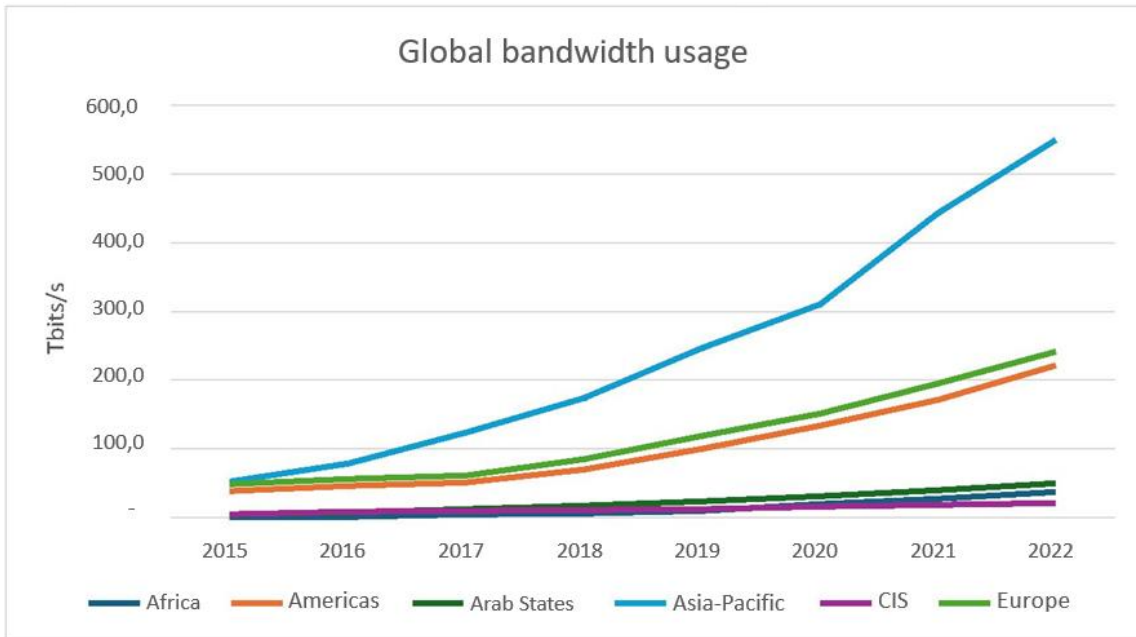
Figure 1: Internet users by world region. Source: UN ITU.



The graph above shows the evolution of the number of Internet users in millions over the years, broken down by world region. In the case of Africa, the growth is remarkable, although it starts from very low figures compared to other regions. In 2005, the continent had only 15 million internet users, and over the years it has experienced steady growth, reaching 434 million by 2023. This growth reflects both the increased availability of technological infrastructures and the expansion of access to mobile devices, which in many cases are the main gateway to the Internet in the region.

Despite this significant growth, Africa still lags behind other regions of the world in absolute terms. For example, in 2023, Asia-Pacific had 2,914 million users, while Europe and the Americas had 621 million and 903 million, respectively. However, the growth rate in Africa is one of the fastest, as in just over 15 years, the region has increased its number of users by almost 30 times.

Figure 2: Bandwidth usage by region. Source: UN ITU.



The graph above shows international bandwidth usage (in terabits per second, Tbit/s) by world region from 2015 to 2023. For Africa, there is significant growth, although it started later and from much lower levels than other regions. In 2015, Africa had an international bandwidth usage of only 1.7 Tbit/s, rising rapidly to 37.9 Tbit/s by 2022. This growth is a clear indication of the expansion of digital infrastructure on the continent, as well as the increase in data demand driven by increased internet access and use of digital services.

Despite this growth, Africa still lags behind other regions. For example, in 2022, the Americas recorded international bandwidth usage of 221.9 Tbit/s, while Europe reached 242.7 Tbit/s, and Asia-Pacific ranked as the region with the highest usage at 550.3 Tbit/s. This reflects the differences in the level of technological development and connectivity between regions.

The graph below from ITU's Measuring digital development Facts and Figures 2024 shows the evolution of the number of internet users by region as a percentage between 2019 and 2024. In the case of Africa, although there is a 13-point growth compared to 2019, the figures are still very low compared to other regions and the global average. In 2019, the number of individuals using the internet was 25%, while in 2024 it was 38%. This increase reflects both the increased availability of technological infrastructure and the expansion of access to mobile devices, which in many cases are the main gateway to the internet in the region.

Figure 3 Figure 1: Percentage of individuals using the Internet by world region in 2019 and 2024 Source: ITU.

Percentage of individuals using the Internet by region, 2019 and 2024

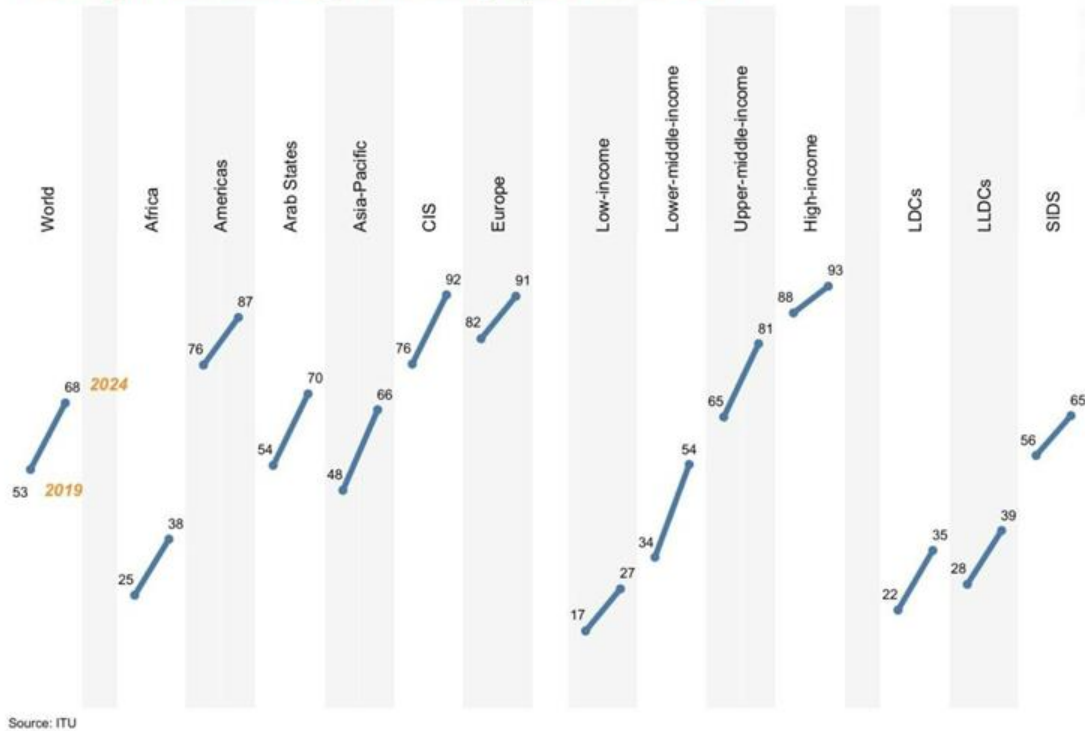
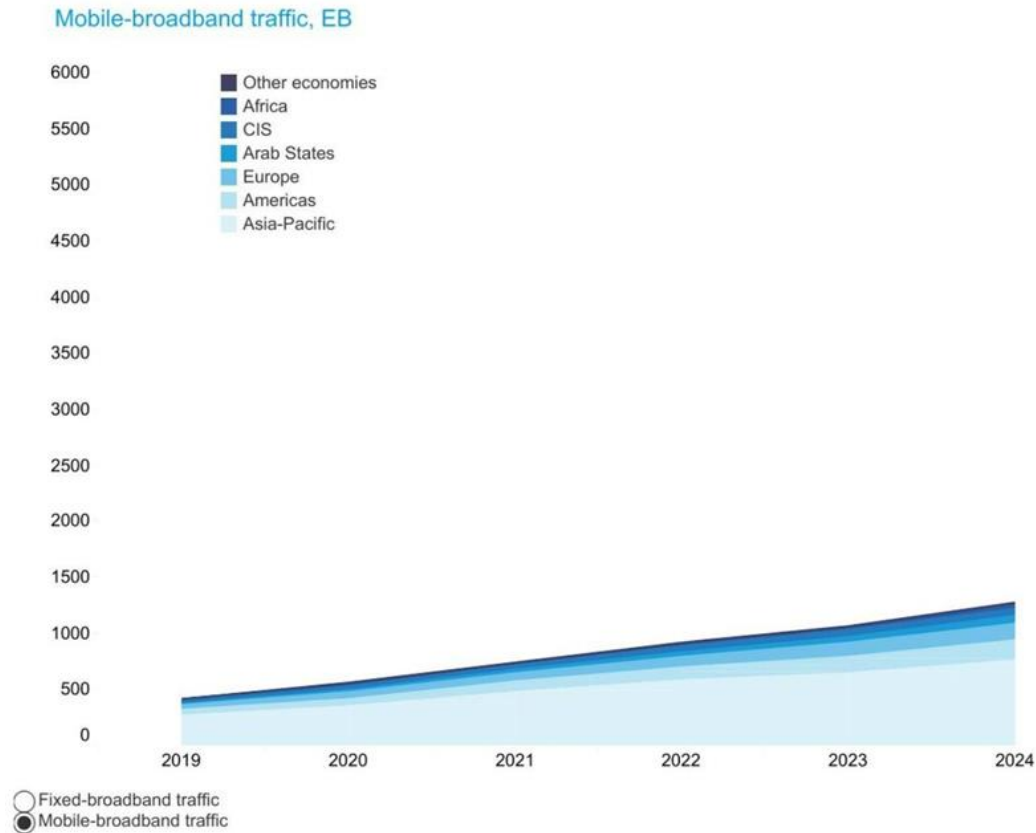


Figure 4 Mobile internet bandwidth traffic in Exabytes (EB) between 2015 and 2024 by world region. Source: ITU.



Note: 1 exabyte (EB) = 10¹² megabytes. Mobile-broadband traffic refers to traffic within the country.
Source: ITU

The graph above shows mobile internet bandwidth traffic (in exabytes) by world region from 2019 to 2024. In the case of Africa, we see remarkable growth, although it started out lagging behind other regions. In 2019, Africa had mobile broadband traffic of 3,9 EB, growing rapidly to 23,2 EB in 2024. This growth is a clear indication of the expansion of digital infrastructure on the continent, as well as the increase in data demand driven by increased internet access and use of digital services.

Despite this growth, Africa still lags behind other regions. For example, in 2024, the Americas had an international mobile bandwidth usage international mobile bandwidth traffic of 175,5 BS, while Europe had 144,3 BS, and Asia-Pacific ranked as the region with the highest usage, at 780,5 BS. This reflects the differences in the level of technological development and connectivity between regions. However, the accelerated growth in Africa suggests that the continent is making rapid progress in terms of capacity and connectivity.

This will be key to improving its competitiveness and bridging the digital divide in the coming years.

The following table presents key indicators of information and communication technology (ICT) development in several African countries, showing data such as mobile coverage (3G and 4G), internet penetration, the proportion of households with access to technology, and the number of fixed, mobile and broadband subscribers. Overall, the data reflect large disparities in ICT adoption and access, highlighting differences between countries in terms of technology infrastructure and connectivity.

Cape Verde and South Africa stand out as leaders in several indicators, with high percentages of internet usage (64% and 70%, respectively), active mobile broadband subscribers, and a significant proportion of connected households. On the other hand, countries such as Niger and Guinea-Bissau show significant lags, with low levels of internet penetration (10% and 23%, respectively) and access to advanced technologies. These disparities underline the challenges Africa faces in terms of digital equity and technological development.

In the specific case of Ghana, the country shows outstanding performance on several key indicators. With 97% mobile coverage, 96% 3G coverage and 68% for 4G, Ghana has a good basic telecommunications infrastructure. However, only 22% of households have access to the internet, reflecting a gap in accessibility and usage of computers and internet provision in the country. The number of active mobile broadband subscribers (130 per 100 inhabitants) is remarkably competitive, ranking among the highest in the region and reflecting relatively more widespread use of advanced services compared to countries such as Senegal and Mauritania, but lower than in Côte d'Ivoire. Although the ITU does not have data on the percentage of urban and rural households with internet access and the percentage of the population owning a mobile phone, the article "The Internet we want: A narrative on current realities" in the Ghanaian business newspaper The Business C Financial Times of September 2024 indicates that the speed of internet connection is below 50% of the urban average.

The fact that 22% of households have internet access and only 16% have a computer at home indicates that, despite good 3G and 4G network coverage, difficulties persist in the accessibility and use of computers at home, as well as in the provision of residential internet, mainly due to its cost.

Table 2: Main ICT development indicators. Source: own elaboration based on ITU data.

Country	% of population with mobile coverage	% of population with mobile coverage (3G)	% of population with mobile coverage (at least 4G)	% of population owning a mobile phone	% households with Internet access	% households with a computer at home	% rural households with Internet access	% urban households with Internet access	Mobile telephone subscribers (Per 100 inhabitants)	Fixed telephony subscribers (per 100 inhabitants)	Active mobile broadband subscribers (per 100 inhabitants)	% population using Internet
Benin	98%	80%	46%	-	5%	5%	-	-	92	0	27	26%
Burkina Faso	92%	48%	27%	-	-	5%	-	-	106	0	52	22%
Cape Verde	99%	94%	79%	72%	67%	35%	52%	74%	98	10	75	64%
Côte d'Ivoire	98%	95%	60%	68%	17%	12%	7%	25%	152	74	1	36%
Equatorial Guinea	70%	60%	0%	-	-	-	-	-	46	1	0	26%
Gambia	98%	88%	7%	-	63%	19%	-	-	111	2	55	36%
Ghana	97%	96%	68%	-	22%	16%	-	-	130	1	85	58%
Guinea	88%	40%	29%	77%	13%	7%	1%	9%	105	0	24	26%
Guinea-Bissau	100%	33%	0%	-	-	7%	-	-	97	0	40	23%
Kenya	96%	94%	77%	47%	18%	9%	15%	56%	114	0	47	29%
Liberia	76%	63%	35%	-	-	7%	-	-	33	0	7	26%
Mali	100%	65%	45%	-	22%	5%	10%	50%	125	1	46	27%
Morocco	100%	99%	99%	96%	85%	64%	57%	82%	134	6	75	84%
Mauritania	96%	43%	0%	-	3%	7%	-	-	106	1	62	41%
Niger	92%	24%	15%	65%	10%	12%	5%	39%	59	0	6	10%
Nigeria	91%	74%	41%	41%	15%	6%	2%	18%	99	0	42	35%
Senegal	99%	99%	75%	-	7%	10%	-	-	114	1	67	43%
Sierra Leone	85%	65%	40%	-	14%	6%	-	-	86	0	20	18%
South Africa	100%	100%	96%	78%	63%	23%	43%	70%	162	4	111	70%
Togo	98%	91%	67%	44%	26%	10%	-	-	79	1	31	24%

2.2 Ghana's Economic Situation

Ghana, the country of study of this report, is located in West Africa, on the coast of the Atlantic Ocean, bordered by Burkina Faso to the north, Togo to the east, and Côte d'Ivoire to the west.

Figure 5 Location of Ghana on the African continent: Source: CIA World Factbook.



Below are the basic facts about the country:

Table 2: General information on Ghana. Sources: CIA World Factbook,

Capital	Accra
Population (2024)	34.589.092 inhabitants
Total area	258.533 km ²
Name and position of head of Government	John Dramani Mahama, President of the Republic of Ghana (from 7 January 2025)
Currency and denomination	Ghanaian Cedi (GHS)
Equivalent in euros	1 EUR= 15.32 GHS (as of January 2025)
Religion	Christianity, Islam and Traditional Religions
Languages official	English
Growth of the population (2024)	+2,15%
Expectation of life	70,1 years
Expectancy Degree literacy	79%
Rate gross of birth rate (per thousand)	27,6 births/1.000 population
Rate gross of mortality (per thousand)	5,9 deaths/1.000 population

The Ghanaian economy is well diversified, with the services sector being the largest contributor to GDP. Onshore hydrocarbon exploitation is expected to contribute to the growth of the economy, as well as progress in the diversification of the agricultural sector, especially cocoa production, moving towards the manufacture of cocoa derivatives.

Although the economy is diversified, high inflation and debt owed to international creditors are the two main obstacles to the Ghanaian economy, especially when it comes to investment. The country is also vulnerable to geopolitical events such as the continuation of the war in Ukraine and the lack of access to international sources of finance.

Below are the basic data for Ghana based on information from the World Bank and the CIA World Fact Book:

Table 3 Main economic indicators for (2022-2025): Sources: World Bank, CIA World Fact Book.

Ghana's main economic indicators (2022-2025)	
Currency	Ghanaian Cedi (GHS)
GDP 2023 (at current prices)	76,37 billion from USD
Annual real GDP growth (Estimated for 2025)	4,5%
Inflation (2025)	10,2%
Unemployment rate (2023)	3,1%
GDP by sector (2023)	Agriculture: 21,1% Industry: 29,5% Services: 42,5%
GDP per capita (2025)	2.190 USD
External debt (% of GDP)	57,1%
Foreign direct investment, % of GDP (2023)	1,7%
Value of exports of goods (2022)	25,99 million from USD
Value of imports of goods (2022)	26,73 million USD
Current account balance in relation to GDP (2025)	1,3%

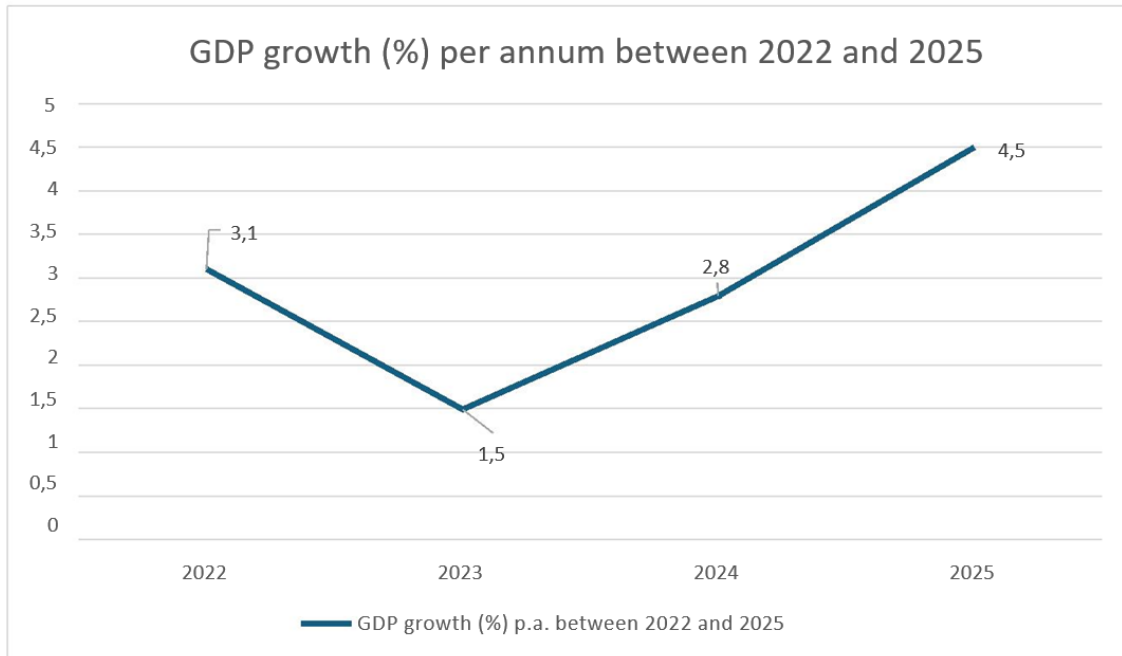
GDP growth

According to the African Development Bank, Ghana's economy contracted by 2,9 per cent in 2023, after recording 3,8 per cent growth in 2022. This decline is attributed to the spill-over effects of the war in Ukraine, global macroeconomic changes and international financial adjustments, which resulted in an economic crisis driven by the country's debt restructuring.

However, in 2024 the economy showed signs of recovery, reaching 4,4% growth, driven by buoyant industry, the services sector, private consumption and increased investment.

Projections for the coming years point to GDP growth of 4.5% in 2025 and 4,9% in 2026. This upturn would be largely supported by the expansion of hydrocarbon production, with the start of exploitation of the Pecan field and the possible discovery of new reserves in Ntomme Far West, key factors in the country's economic growth prospects.

Illustration c: Annual GDP growth between 2022 and 2025(%) Source: African Development Bank.

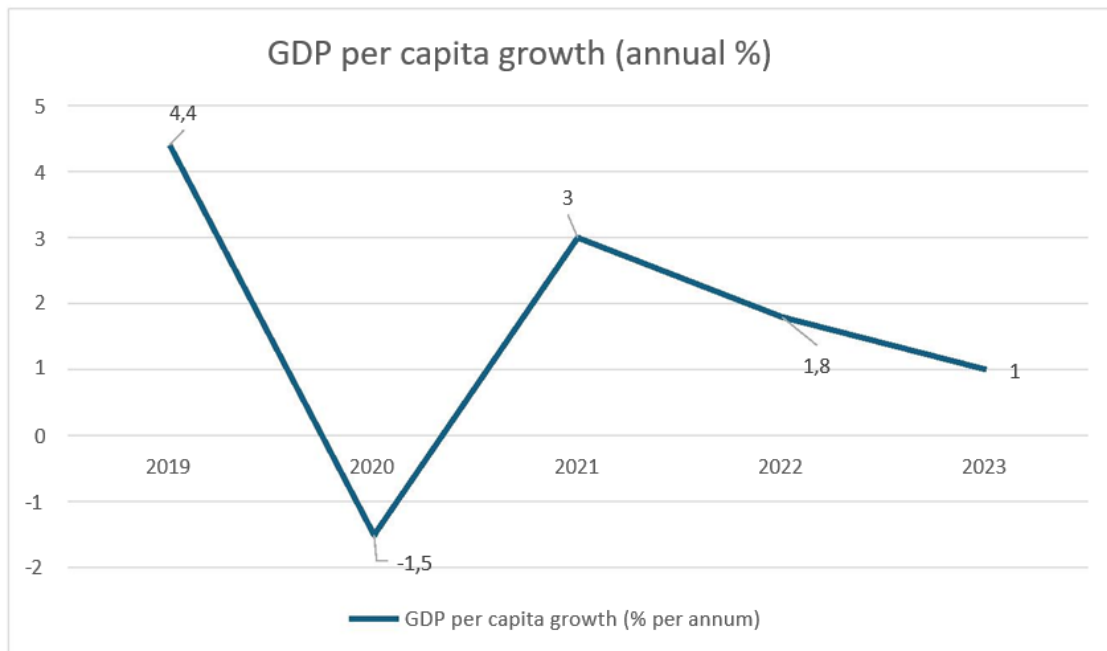


Since 2020, when GDP per capita fell to -1,5%, the economy has managed to remain in positive territory. However, after peaking at 3% in 2021, it experienced a gradual slowdown to 1% in 2023.

According to the African Development Bank's Africa Economic Outlook, this slowdown was due to macroeconomic instability, global spending adjustments and the spillover effects of the outbreak of war in Ukraine, which led the Ghanaian government to adopt a tight monetary policy.

Despite this slowdown, the African Development Bank's projections indicate that GDP per capita could grow by 4,5% in 2025, reflecting a recovery driven by macroeconomic stabilisation and dynamism in key sectors of the economy.

Figure 7: GDP per capita growth between 2015 and 2022 (% p.a.) Source: World Bank

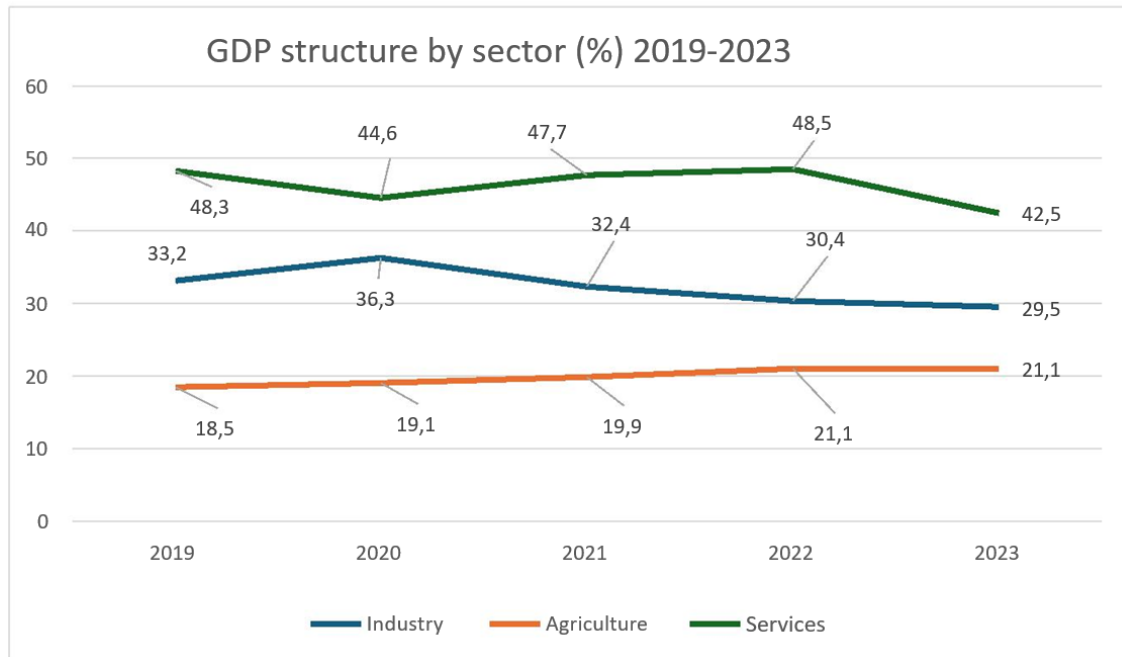


The contribution of the agricultural sector to Ghana's GDP increased between 2019 and 2023 from 18,5% to 21,1%, reflecting a steady growth in its share of the economy.

Industry, on the other hand, showed a downward trend. It reached a peak of 36% in 2020, but has since experienced a progressive decline, standing at 29,5% in 2023, below the 30% threshold it maintained in 2019.

The services sector remains the mainstay of the Ghanaian economy, accounting for close to 50% of GDP between 2019 and 2022. However, it fell significantly to 42,5% in 2023, a decline attributed to the economic crisis resulting from the restructuring of the country's high external debt and its impact on the dynamism of consumption and investment.

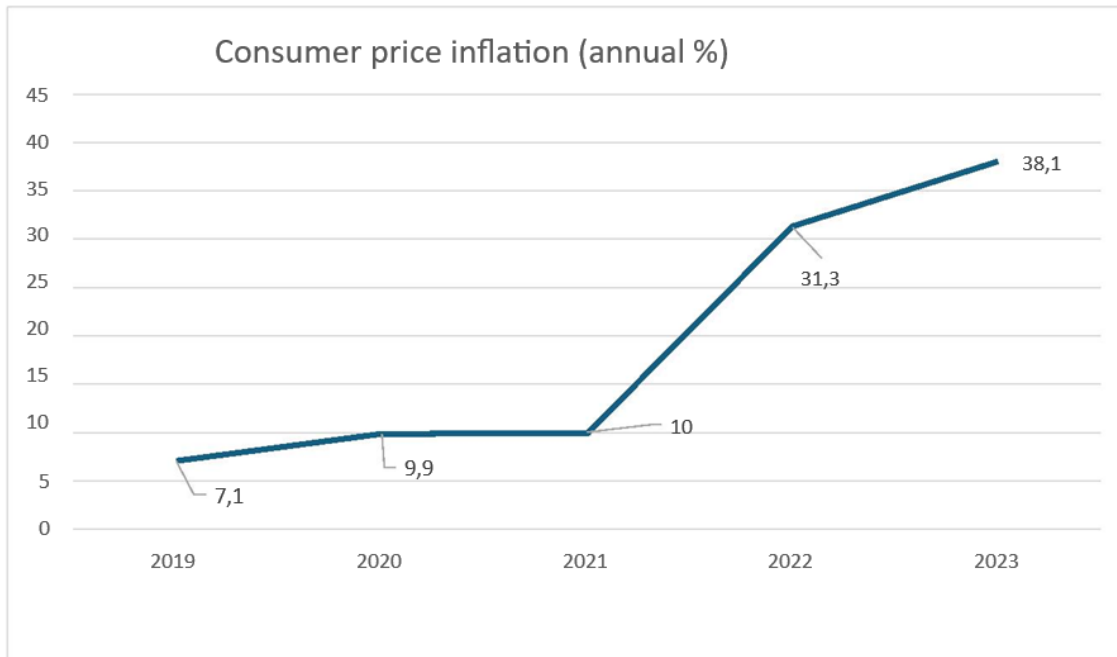
Illustration 8: GDP structure by sector 2015-2023. Source: World Bank: World Bank.



Inflation

Inflation, which experienced a slight rise of 2.8 points between 2019 and 2020 as a result of the impact of the COVID-19 pandemic on the economy, boomed between 2021 and 2022 from 10% to 31,3%. This increase was due to the Ghanaian economy's high dependence on agricultural and mining exports, both of which are vulnerable to global disruptions caused by the Ukraine war. In 2023, inflation rose again to 38,1% as a consequence of the economic crisis resulting from the high debt restructuring and the downgrading of the credit agencies' assessment.

Illustration 5: Consumer price inflation. Source: World Bank: World Bank.



Labour market and unemployment

According to the most recent data from the United Nations Population Fund (UNFPA), in 2024 the country had a working age population of 60%, although the lack of data on the percentage of men and women makes it difficult to make an initial assessment of the presence of women in the Ghanaian labour market.

In terms of economic sectors, in 2023, the services sector is the main driver of employment, representing 46.9% of available employment, according to World Bank data, followed by the agricultural sector with 35.4%, while industry accounted for 17.7% of available jobs.

The informal sector is pervasive in the Ghanaian economy employing 80% of the labour force, contributing 27% of GDP, according to the National Productivity, Employment and Growth Report of the state data collector, the Ghana Statistical Service (GSS), 2025. The report indicates that low productivity, underemployment and stagnant wages are characteristics of the informal economy in the country, which are obstacles to the growth of the Ghanaian economy and productivity growth.

One of the main labour market challenges in Ghana is the provision of both basic and advanced skills training to both the employed and unemployed population. Although up-to-date data on unemployment by educational attainment are not yet available, both from international agencies and from the government, there is still a lack of data on unemployment by educational attainment.

The World Bank indicates that the youth unemployment rate in 2023 stood at 5.50%, while unemployment among educated people, including university graduates and those with vocational and professional training, is expected to increase.

To address these challenges, the government has implemented a number of employment support programmes especially in technical and vocational education and training (TVET) and apprenticeship and vocational training programmes.

In the area of TVET programmes, the Ghana Skills and Technology Development Project (GSTDP) funded by the World Bank and the Danish International Development Agency (DANIDA) aims to provide improved vocational guidance, financing and infrastructure for TVET jobs. There is also the Ghana Skills and Development Initiative (GSDI) funded by GIZ and COTVET to gear apprenticeships towards skills acquisition and the Ghana TVET Voucher Project geared towards handicrafts.

There are two apprenticeship programmes: the National Apprenticeship Programme (NAP) to standardise apprenticeship training and the Industrial Apprenticeship Opportunities in Ghana (OICG) offering training in 18 trades for youth without tertiary education.

Impact analysis of these programmes shows that young people who participated in apprenticeship programmes are significantly more likely to obtain formal employment and promote self-employment, thereby reducing the likelihood of entering the informal employment market.

Despite these advances, structural obstacles persist that limit the generation of quality jobs. There is weak productive diversification, with a strong dependence on extractive economic activities such as oil and mining. According to the World Bank report. This sector is weakly digitised and this dependence restricts job creation in sectors with greater growth potential, such as information and communication technologies (ICTs), which could contribute to increased productivity both in the extractive economy and in other sectors.

The country's low level of industrialisation results in a lack of effective policies to integrate the agricultural workforce into the manufacturing sector. This hinders economic diversification and limits job opportunities in industry. There is also a mismatch between TVET training provision and market demands. According to the Report on the Technical and Vocational Education Sector by the Ministry of Education and the Commission for Technical Education and Training, technical education remains theoretical, with obsolete equipment and little industry involvement in defining skills.

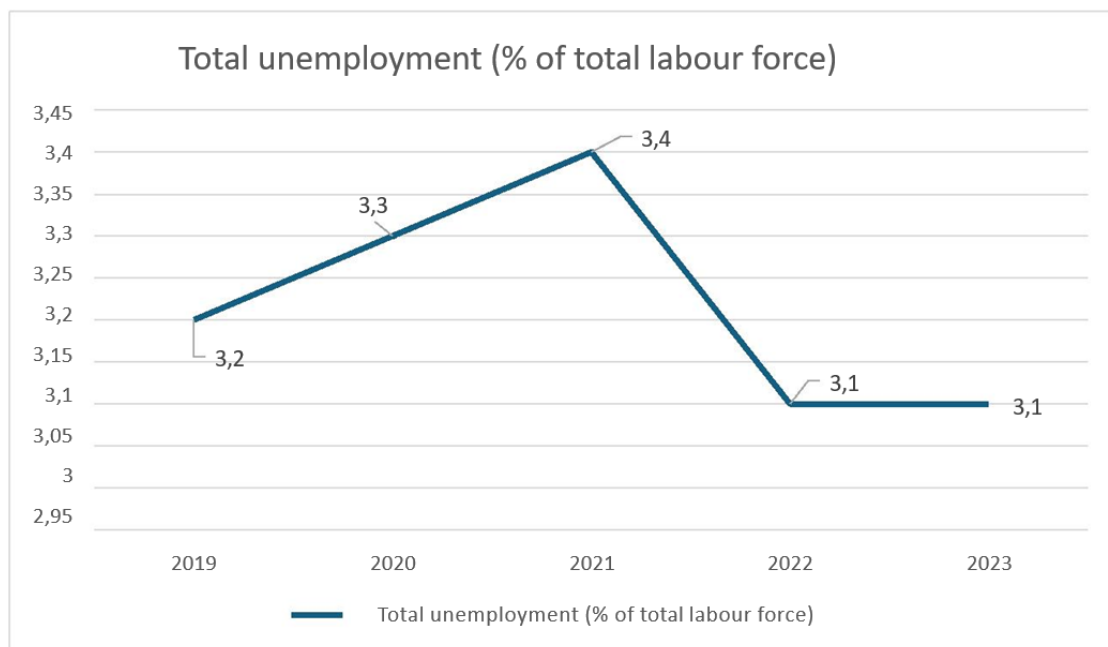
country, can play a fundamental role in expanding employment and inclusive economic development.

According to the latest available data from the World Bank, unemployment in Ghana was 3,1% in 2023, the same figure as in 2022. However, these statistics do not take into account the unemployed who are not in the system, so the figures shown may not be the real figures, the World Bank and the World Organization of Workers warn.

The under-reporting of the unemployed in the case of Ghana could indicate that a considerable part of the labour force is not being accounted for in the official metrics. This could be due to various factors, such as informality in the labour market, lack of access to labour registration or demotivation towards the formal job search system.

In addition, the evolution of unemployment in Ghana in 2022 and 2023 may reflect structural changes in the Ghanaian economy that merit further analysis. For example, it is possible that there is an increase in the labour force or that specific sectors of the economy are facing difficulties, which could be pushing more people into unemployment or informality. It is also possible that the unemployment rate may have been higher between 2022 and 2023 given that the Ghanaian economy experienced a recession in that period, and that it is possible that many of the unemployed ended up in the informal economy.

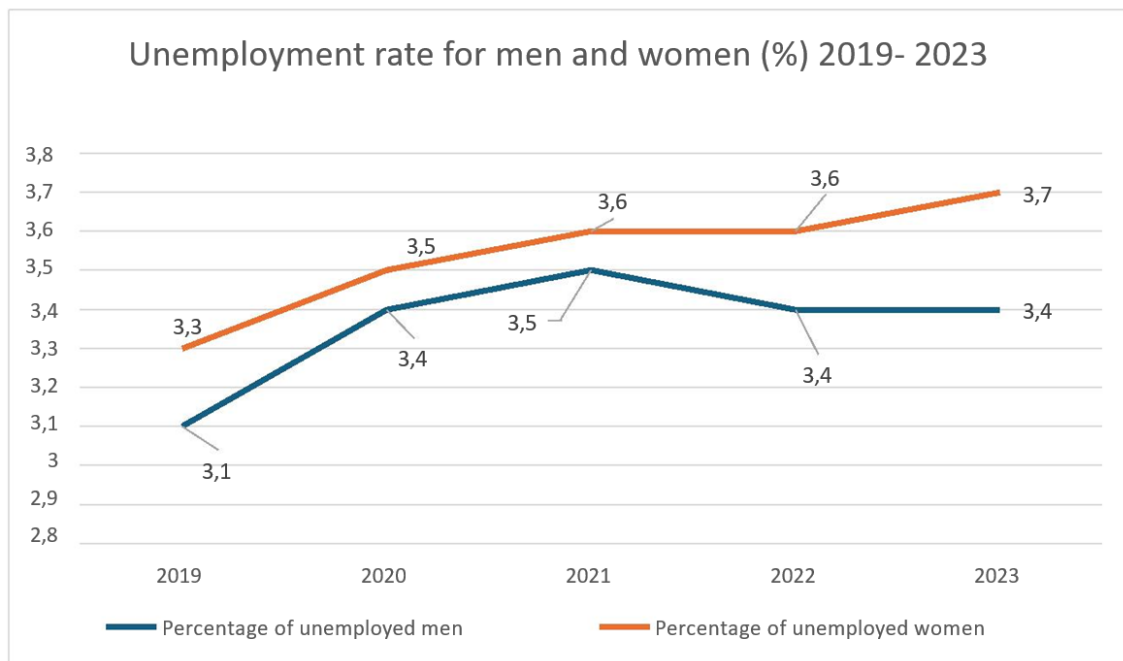
Figure 10: Total unemployment rate (% of total labour force) 2015-2022 Source: World Bank.



The data indicate that unemployment increased between 2019 and 2021, due to the impact on the Ghanaian economy of the COVID-19 pandemic on trade flows. We note how in 2022 unemployment declined by 0,3 points to 3,1%, indicating that the economy experienced an improvement in 2022.

As for male and female unemployment, we observe a steady increase in female unemployment between 2019 and 2023 from 3,3% to 3,7%. In the case of male unemployment, we observe an increase between 2019 and 2021 as a consequence of the impact of the COVID-19 pandemic, reaching a maximum of 3,5%, although in 2022 it fell to 3,4%, remaining at that figure in 2023. Although at first glance the difference in unemployment between men and women is not that high (there is a 0,3% difference between the unemployment rate of men and women in 2023), the slight increase in female unemployment indicates that women's entry into the labour market has not recovered after the COVID-19 pandemic, indicating that there are still challenges in finding employment.

Illustration 11 Evolution of male and female unemployment rate in Ghana 2015-2022. Source: World Bank.



African Digital Transformation Strategy 2020-2030

The African Union (AU) Digital Transformation Strategy 2020-2030 is an ambitious framework designed to position Africa as a key player in the global digital economy, leveraging digital technologies to drive inclusive and sustainable development on the continent. This strategy is based on the premise that digitisation is a crucial driver for innovation, job creation and poverty eradication, with a particular focus on bridging the digital divide that has historically limited equitable access to technological opportunities. Africa has a young and rapidly growing population, with more than 60% of its people under the age of 25, representing a unique opportunity to harness the potential of digital transformation and foster a dynamic innovation ecosystem. However, the continent also faces significant challenges, such as a lack of adequate technological infrastructure, limited connectivity in rural areas, high internet access costs and a shortage of digital skills among the workforce.

Among the main objectives of the 2030 strategy is the creation of an African Digital Single Market (DSM) to facilitate the free movement of people, goods and services online, within the framework of the African Continental Free Trade Agreement (AfCFTA). The AU seeks to ensure that, by 2030, all Africans have secure and affordable access to the internet at a minimum speed of 6 Mbps and at a cost of no more than USD 0.01 per megabyte, and to promote the manufacture of smart devices on the continent at an affordable price of no more than USD 100. The strategy also aims to bridge the digital divide between urban and rural areas, foster innovation through the development of sustainable digital ecosystems, ensure digital sovereignty through harmonised regulatory frameworks, and strengthen cybersecurity to protect citizens' data and privacy.

The success of this strategy depends largely on the ability of member countries to implement effective digital policies tailored to their national realities. In this regard, some African countries have managed to position themselves as leaders in digital transformation and serve as models for other nations. Rwanda, for example, has made significant progress with its 'Smart Rwanda' strategy, which seeks to digitise key sectors such as health, education and e-government, with more than 90% of government procedures now carried out online. Kenya, for its part, has consolidated its leadership in digital financial inclusion with the expansion of solutions such as MPesa, which has enabled millions of citizens to access mobile financial services, reducing the banking inclusion gap. South Africa, with its strong telecommunications infrastructure and policies to encourage technological investment, has developed an environment conducive to innovation, attracting global technology companies and fostering local digital entrepreneurship.

Other countries such as Ghana and Egypt have also implemented digitalisation strategies with a focus on digital education and cybersecurity, respectively, strengthening their ability to compete in the global digital economy.

Despite these advances, common challenges facing the continent include a lack of investment in broadband infrastructure, a dearth of effective cybersecurity policies, and the need for greater regulatory harmonisation across countries to facilitate cross-border e-commerce. In addition, the gender gap in digital access remains a significant challenge, with lower participation of women in the technology sector and in the use of digital services. The limited interoperability of national systems also represents a barrier to continent-wide digital integration, making it difficult to create a trusted environment for secure digital transactions.

Positioning Ghana in the digital strategy

Ghana as one of the key countries in West Africa, has shown a strong political and strategic will to align with the continental digital vision, implementing initiatives that reflect the AU's objectives in key sectors such as digital infrastructure, education and business innovation.

Evidence of this commitment is the launch of the 2024 Ghana Digital Economy Policy and Strategy, which focuses on strengthening digital skills in school education and vocational training for both students and teachers, promoting online training, digitising key economic sectors such as agriculture, manufacturing and finance, and fostering innovation hubs and accelerators for tech startups with the support of the Ghana Entrepreneurship Agency (GEA) and the National Entrepreneurship and Innovation Programme (NEIP).

According to the strategy, mobile network penetration has increased by 120%, while internet penetration stands at 71,9%, with investment in the expansion of fibre optic and 4G infrastructure, although connectivity in rural areas is limited, demonstrating that there is a rural-urban divide in terms of internet access and digitisation. In line with the AU strategy, the Ghanaian government has undertaken efforts to reduce the costs of broadband access by adopting regulations that encourage internet service providers to share infrastructure to prevent duplication of costs and improve network efficiency, regulating tariffs and access costs to avoid monopolies and ensure competitiveness, promoting low-cost internet schemes for vulnerable populations and free access to essential digital services in sectors such as education and health.

In terms of regulatory policies, Ghana has adopted a National Data Governance Strategy in line with the African Union Data Policy to ensure security, privacy and the secure and efficient exchange of data between businesses and institutions. A digital identification system centred on the Ghana Card was also adopted to facilitate access to financial and government services through digital platforms.

Key developments in both include the development of a National Data Governance Framework and a data classification system with three indicators (open, compliant and restricted) to ensure secure and efficient access to sources, the strengthening of cybersecurity mechanisms, especially for digital transactions and online government services, and the adoption of the Ghana Card as the main national biometric ID, with its use being mandatory for accessing government services (health, social security and taxation), financial and telecommunications services.

Despite these advances, low awareness of data protection, lack of integration of data systems between different government ministries and agencies and the difficulty of accessing the Ghana Card in rural areas are the main obstacles to regulating digitisation in Ghana. In the area of digital skills acquisition, the lack of training in digital literacy, technological literacy and expertise in data management and cybersecurity complicate digitisation in the country, especially the use of the Ghana Card in rural areas.

In terms of technology adoption by small and medium-sized enterprises (SMEs), Ghana has increased the use of e-commerce platforms and digital payment systems such as MTN MoMo and Vodafone Cash, and has developed technology innovation hubs. However, lack of funding for technology investments, low digital literacy of entrepreneurs and workers, high prices of digital tools and lack of digital infrastructure in rural areas pose a challenge to the digitisation of SMEs.

In terms of digital economic integration, Ghana has benefited from its participation in the African Continental Free Trade Area (AfCFTA), which seeks to facilitate digital trade between African countries by removing regulatory barriers and promoting common e-commerce standards. The country is working on the development of the African Digital Single Market to facilitate cross-border e-commerce, the expansion of fibre optic, 4G and 5G networks and the interconnection of the Ghana Card with regional digital identification systems under the AfCFTA.

In conclusion, although Ghana has demonstrated a firm commitment to the objectives of the African Union's Digital Transformation Strategy, adopted a regulatory framework for classifying information, and adopted the Ghana Card as the main tool.

for accessing government services biometrically, the country faces several challenges in its digitalisation, such as unequal access between rural and urban areas and a lack of training in digital skills at all levels, both in education and in the world of work. Among the main recommendations are the need to increase investment in fibre optic infrastructure and 4G and 5G networks, especially in rural areas, incorporating digital training into the school curriculum, with an emphasis on programming, artificial intelligence (AI) and data analysis, and promoting the use of e-commerce and fintech platforms among SMEs, as well as creating subsidies for the adoption of technology in key economic sectors such as agriculture, manufacturing and trade. Cooperation with the AU and other regional organisations will be essential to overcoming these challenges and ensuring that Ghana fully exploits the opportunities offered by digitalisation for its economic and social development in the coming years.

3. Government policies and digitisation in Ghana

Over the past two decades, Ghana has made significant progress in the adoption of information and communication technologies (ICT) as part of its economic development and state modernisation strategy. Digitisation has been recognised as a key pillar for improving government efficiency, fostering financial inclusion, enhancing technological innovation and strengthening the competitiveness of the Ghanaian economy in the digital age.

Since the adoption of the ICT for Accelerated Development (ICT4AD) policy in 2003, the country has implemented multiple initiatives to transform its digital infrastructure, expand access to connectivity and promote an ecosystem conducive to technological innovation and entrepreneurship. The Digital Ghana Agenda and the Digital Economy Policy and Strategy have been the most recent guiding plans, aimed at consolidating Ghana as a digital hub in West Africa. These strategies seek to leverage ICT to improve public services, reduce bureaucracy, facilitate access to education and digital health, and attract investment in emerging sectors such as fintech, artificial intelligence and cybersecurity.

The Ghanaian government's efforts have been supported by a solid institutional framework, with the Ministry of Communications and Digitalisation (MoCD) leading the planning and implementation of digital policies. Various government agencies, such as the National Communications Authority (NCA), the National Information Technology Agency (NITA) and the Electronic Communications Investment Fund (GIFEC), have played

a key role in expanding connectivity, regulating the digital sector and implementing digital inclusion initiatives. The creation of the Cybersecurity Authority (CSA) and the Data Protection Commission (DPC) has helped to ensure security and privacy in the digital environment, fostering trust in electronic platforms and in government and private digital services.

The impact of these policies has been significant. The digitisation of public services has enabled the implementation of systems such as the GhanaCard, a biometric identity card that facilitates digital authentication of citizens, and the Ghana.gov platform, which centralises government procedures online. In addition, the interoperability of mobile money has revolutionised access to financial services, allowing more than 90 % of the adult population to transact electronically without the need for a traditional bank account.

In the area of technology entrepreneurship, Ghana has positioned itself as one of the most dynamic ecosystems in West Africa. With the support of the National Entrepreneurship and Innovation Programme (NEIP) and the forthcoming Ghana Innovation and Startups Act, the government has promoted the creation and expansion of technology startups, facilitating their access to funding, mentoring and international markets. Initiatives such as the Venture Capital Trust Fund (VCTF) have channelled investment into early-stage startups, while incubators and accelerators such as MEST Ghana, Impact Hub Accra and Ghana Tech Lab have played a key role in nurturing and growing new digital businesses.

Beyond the ICT sector, digitisation has permeated other strategic areas. In the education sector, the government has connected over 700 secondary schools and universities to broadband internet and distributed laptops to teachers as part of the One-Teacher One-Laptop programme. In health, the adoption of the National e-Pharmacy Platform and the use of drones for the delivery of medical supplies have transformed access to healthcare, especially in rural areas. In agriculture, digital technologies are being promoted to improve productivity and access to markets for smallholder farmers.

Despite these advances, Ghana still faces significant challenges. The digital divide remains a problem, with approximately 31,8% of the population without regular access to the Internet. Factors such as the cost of devices, mobile data plans, lack of energy infrastructure in rural areas, and limited digital literacy in certain sectors of the population hinder full digital inclusion. Furthermore, the financial sustainability of digital initiatives, the retention of technological talent, and the need for flexible and up-to-date regulation remain critical areas for ensuring the success of the country's digital strategy.

All in all, Ghana has made significant progress in its digitisation process, establishing itself as a benchmark in West Africa for digital transformation, financial inclusion and government modernisation. The implementation of strategies such as the Ghana Digital Agenda and the Digital Economy Policy and Strategy has enabled the expansion of digital infrastructures, improved access to electronic public services and the strengthening of the entrepreneurial ecosystem. However, despite the progress made, the country still faces structural challenges such as the persistence of the digital divide, the affordability of internet access, the need for retention of technology talent and the financial sustainability of its digital initiatives. Long-term success will depend on the government's ability to consolidate a flexible regulatory environment, maintain the momentum of investment in digital infrastructure and encourage greater private sector participation in technological innovation.

This section examines the importance of digital skills in Ghana and the gaps that persist in the tech sector, drawing on official documents such as the Ghana Digital Economy Policy and Strategy 2024 by the Ministry of Communications and Digitisation (MoCD) the Ghana Industrial Skills Gap Survey 2023, and the World Bank's 2019 Digital Skills in Sub-Saharan Africa: Spotlight on Ghana report. They all indicate that technology companies face difficulties in finding candidates with advanced skills and that, despite the government's target of 70% of the working age population acquiring basic digital skills by 2030, the demand for advanced digital profiles in cybersecurity, data analytics, artificial intelligence continues to increase, with a mismatch between the supply of training and the skills required by the labour market.

3.1 ICT vision for Ghana's economic development

Ghana has considered ICT as a pillar of its development for decades. In 2003 it adopted the "ICT for Accelerated Development (ICT4AD)" policy as a roadmap for building a knowledge-based economy, with an emphasis on digital infrastructure and the digitisation of public administration, health and education.

In recent years, the government launched the Digital Ghana Agenda to drive the digital transformation of the entire economy. This agenda proposes to digitize government services and develop key systems such as a national biometric identity registry, a digital postal address platform and mobile money interoperability, as well as implementing paperless procedures at ports, among other objectives.

The underlying vision is to harness technology to increase competitiveness, formalize the informal economy and provide more efficient and transparent public services.

Ghana's commitment to the digital economy is embodied in its new Digital Economy Policy and Strategy presented in 2024. This plan sets a target of increasing the contribution of the digital economy to GDP from 4.4% in 2020 to 5.3% by 2025, focusing on five critical areas: universal access and connectivity, digital governance, digital skills and R&D, digital entrepreneurship, and data/emerging technologies.

In line with the Ghana Beyond Aid agenda, the country seeks to position itself as a leader in ICT innovation in Africa by expanding its local technology industry, bridging the urban-rural digital divide and applying ICT to improve efficiency in all sectors.

For example, thousands of kilometers of fibre optics have been laid and almost a thousand public institutions have been connected to a high-speed network, as a basis for bridging the urban-rural access gap.

Digitisation efforts are already showing results. The digital ecosystem is one of the fastest growing in Ghana, with an average annual increase of 19% between 2014 and 2020, placing the country among the digital leaders in sub-Saharan Africa.

Initiatives such as biometric identification (GhanaCard) have registered more than 15 million citizens, providing a unique identity that will serve as the basis for future transactions and services.

In addition, the implementation of a digital address system has assigned unique codes to 7.5 million properties, making Ghana a pioneer in Africa in establishing an integrated digital address platform with street names and numbers.

The introduction of mobile money interoperability between all telephone companies and banks - also a first in Africa - enabled more than 90% of Ghanaian adults to access financial services equivalent to a bank account through their mobile phones.

These achievements reflect the vision of inclusive growth driven by digitisation. However, the government recognises that there remain significant challenges (infrastructure, skills, access costs) that need to be overcome to fully harness ICT for economic development.

3.2 Government structure for digitisation

The implementation of Ghana's digital agenda is led by a well-defined government structure. The Ministry of Communications and Digitisation (MoCD) is the governing body that formulates ICT sector policies and strategies.

The MoCD coordinates the digital modernisation of the government and works closely with various specialised government agencies:

- National Communications Authority (NCA): regulator of the electronic communications sector. It is responsible for licensing and creating an enabling environment for the mass deployment of ICTs, ensuring competition and quality in telecommunications. For example, the NCA oversees the implementation of new generation mobile networks and projects such as number portability and has established a telecommunications service quality monitoring center to improve network coverage and performance.
- National Information Technology Agency (NITA): technical agency in charge of ensuring the standardisation and security of government ICT applications. NITA leads e-government projects and ensures the interoperability of systems between ministries, promoting the adoption of common platforms (e.g. unified document management systems or integrated public service portals).
- Investment Fund for Electronic Communications (GIFEC): a public fund dedicated to expanding ICT access in rural and disadvantaged communities. Under the MoCD, GIFEC channels resources (including contributions from operators through universal service funds) to install infrastructure in remote areas: community internet access centers, rural telephony projects and satellite connectivity. A flagship project is the Ghana Rural Telephony and Digital Inclusion Project, through which 2.000 solar-powered rural telephony antennas are being deployed in partnership with private operators to bring mobile signal to an additional 3,4 million inhabitants and increase national coverage from 83% to 95% of the territory. These initiatives allow remote populations to be integrated into the country's digital economy.
- Cybersecurity Authority (CSA) and Data Protection Commission (DPC): bodies set up to strengthen trust in the digital environment. The CSA regulates cyber security, issues guidelines to protect critical infrastructure and coordinates incident response, complementing efforts such as the national Computer Emergency Response Team (CERT). The DPC is a privacy watchdog.

The DPC ensures the privacy of personal data and compliance with the Data Protection Act, positioning Ghana as a regional benchmark in data governance. These entities work alongside the MoCD to ensure that digital transformation takes place in a manner that is secure and respectful of citizens' rights.

In addition to the Communications portfolio, other government institutions play important roles in the digital agenda. The Bank of Ghana (BoG), for example, has been a key player in financial digitisation: it oversees the national payments infrastructure (such as the interoperable GhIPSS platform), regulates fintech activity (mobile payments, e-wallets) and even explores innovations such as regulatory sandboxes for new payment services and the possible issuance of a central bank digital currency (e-Cedi). This central bank involvement has facilitated milestones such as the full interoperability between mobile money and bank accounts mentioned above.

In terms of modernising public administration, the government has established platforms and reforms to digitise procedures and improve government efficiency. The Ghana.gov unified portal allows citizens and businesses to access numerous services online (passport application, driving license, commercial registration, national health insurance renewal, tax payment, etc.) and to make electronic payments centrally. This platform, together with the adoption of the GhanaCard as a unique identifier in public databases (e.g. as a tax identification number), has been instrumental in integrating previously isolated systems and reducing corruption and delays in processing. E-government projects have also been implemented in several ministries: paperless customs at ports, digitised and interconnected birth and death registries, electronic medical records in public hospitals, among others.

To coordinate these initiatives, MoCD works with other sectoral portfolios (Education, Health, Agriculture, etc.), with technical support from NITA and under the strategic supervision of the Office of the Vice President, who has been the champion of the government's digitalisation agenda.

Finally, the government has also created programmes to foster technological entrepreneurship (detailed in the next section) and has involved the private sector in the definition of policies. One example is the participatory drafting of a Startups Act in conjunction with associations such as the Ghana Startup Network.

As we can see, Ghana has a comprehensive institutional architecture—covering regulation, technological implementation, digital security, and inclusion—to promote digitisation in all areas, ensuring coordinated implementation of ICT policies and addressing the various components of the digital ecosystem, although it does face a number of challenges that will be addressed in this report.

3.3 Promoting startups and supporting innovation

Ghana's entrepreneurial ecosystem has established itself as one of the most dynamic in Africa, following Nigeria, Kenya, Egypt and South Africa. The government recognizes digital entrepreneurship and innovation as key drivers of economic growth and job creation and has implemented various support initiatives. Small and medium-sized enterprises (SMEs) currently account for 85% of the country's businesses and contribute about 70% of GDP, so strengthening the startup ecosystem is strategic for Ghana. Thanks to the public-private push, funding to Ghanaian startups has grown rapidly - in 2021 alone, local startups raised \$167 million in investments (144% more than the previous year) - positioning Ghana among the top four destinations for venture capital in West Africa.

To encourage this trend, the Government of Ghana launched the National Entrepreneurship and Innovation Programme (NEIP) in 2017, conceived as a flagship initiative to incubate startups. NEIP offers comprehensive support to startups and entrepreneurs: business skills training, incubation/acceleration spaces, mentoring and access to seed funding. According to the agency itself, its goal is to help small businesses grow into sustainable companies, in line with Ghana's vision of building an industrialised economy that creates quality jobs.

NEIP's programmes include competitions such as the Presidential Pitch, in which young entrepreneurs pitch their ideas to investors (and the president himself) for seed capital and institutional support. The NEIP has also launched massive training initiatives, such as Skills for Jobs, with the goal of training 100.000 young people and creating 120.000 jobs in new technology-based companies.

These government actions aim to reduce barriers to entry for local entrepreneurs, traditionally limited by a lack of start-up funding and business knowledge.

Another important piece of public support for innovation is the developing regulatory and funding framework. In 2024, the government worked together with private actors to pass the Ghana Innovation and Startups Act, aimed at creating a more favorable environment for startups. This bill proposes incentives such as tax breaks of up to 8 years for new startups, the creation of a Ghana Innovation and Startups Fund to provide targeted financial support, training programmes on intellectual property protection, market access facilities and even "second chance" mechanisms.

(bankruptcy support) mechanisms for entrepreneurs. If implemented, this law will establish a solid legal basis for the promotion of technology-based companies, similar to the "Startup Acts" already in force in other African countries. In parallel, the government has strengthened existing financial instruments such as the Venture Capital Trust Fund (VCTF), a public trust fund created to channel resources to venture capital funds that invest in startups and SMEs. The VCTF acts as a government fund of funds and provides co-financing (in equity, debt or even grants) to venture capital managers, helping to bridge the funding gap faced by local entrepreneurs.

The innovation ecosystem in Ghana does not depend only on the central government; it is the result of collaboration between multiple actors. There are more than 100 technology hubs, incubators and accelerators operating in the country, with a high concentration in the Accra-Tema axis (capital), the city of Kumasi and the Western Region (Takoradi). These hubs provide coworking spaces, mentoring, access to technology tools and connections to investors, and are a vital complement to public support. Notable private incubators include MEST Ghana (Meltwater Entrepreneurial School of Technology) - a pan-African school and accelerator offering an intensive 12-month programme in software and business development for young talent – and Impact Hub Accra, which runs a collaborative innovation center and networking programmes for local entrepreneurs.

Initiatives such as Ghana Tech Lab (with private backing) have trained more than 5.000 young people in digital skills, incubating dozens of startups and creating hundreds of jobs in the process. Diaspora organisations and international NGOs are also active contributors: the Office of Diaspora Affairs at the Presidency promotes linkages with Ghanaian mentors and investors abroad, while cooperation programmes such as ENRICH in Africa (European Union) facilitate the connection between African and European innovation ecosystems.

The government also collaborates with multilateral partners to strengthen the startup ecosystem. One example is the Ghana Digital Acceleration Project, funded with \$200 million by the World Bank, which aims to "strengthen the local digital entrepreneurship ecosystem" by supporting startups, women entrepreneurs and ICT skills development among vulnerable populations.

This project complements the previous e-Transform Ghana initiative and includes the creation of a more agile regulatory environment for innovation, the simplification of procedures for new digital businesses and the promotion of technological solutions in productive sectors (agrotech, fintech, etc.).

Despite these advances, challenges persist in the Ghanaian entrepreneurial ecosystem. Many startups face difficulties in scaling up due to limited access to second-stage funding (larger equity rounds), and the angel investment culture is still developing (although improving). Similarly, there is a need to continue strengthening the technological and managerial skills of founders, hence the importance of training initiatives such as those of MESTI (Ministry of Science, Technology and Innovation), which provides entrepreneurial training programmes with seed funding for innovative projects. Experts also point to the need to modernise university curricula in ICT to align the supply of talent with the demands of the sector.

The Ghanaian government is aware of these gaps and seeks to address them through comprehensive policies: a combination of tax incentives, public venture capital funds, training and an enabling legal framework aims to build an environment where startups can be born, grow and compete globally from Ghana. By 2030, the country's goal is to have a thriving innovation ecosystem that consolidates Ghana as a leading technology hub in West Africa, generating prosperity and "Made in Ghana" technology solutions for the world.

3.4 Other relevant Ghanaian government initiatives

In addition to strategies focused on the ICT sector and support for entrepreneurship, the Ghanaian government is driving multiple cross-cutting initiatives to ensure that digital transformation is inclusive and benefits all sectors of society. Some key programmes and efforts in digital inclusion, infrastructure modernisation and sectoral digitisation are highlighted below:

- Digital inclusion and bridging the divide

A central objective of Ghana's digital agenda is to ensure that no one is left behind in the digital age. In bringing connectivity to remote areas, the aforementioned Rural Telephony project has been crucial, enabling previously unconnected communities to access mobile voice and internet. As a result, it is expected to have extended mobile coverage to 95% of the population by mid-decade, bringing online services to millions of rural dwellers. On the social inclusion side, the government has emphasised equal access for vulnerable groups.

For example, the digital inclusion of women is an explicit priority: technology training programmes for women and girls (such as Girls in ICT, among others) are being promoted, and initiatives have been launched to encourage more women to become entrepreneurs in the technology sector. In fact, the new digital policy incorporates gender equality goals and proposes to eliminate cultural and educational barriers that limit female participation in STEM. Similarly, training programmes for people with disabilities are being adapted, recognising that they

require accessible tools and specific digital skills to fully integrate (the Minister of Communications stressed that it is important to ensure that people with disabilities acquire the digital skills necessary to take advantage of the digital revolution).

In terms of digital literacy, the Ministry has undertaken public awareness campaigns in different local languages to educate on the safe use of technology, prevent online fraud and spread the benefits of digital services.

This holistic approach - infrastructure in every corner of the country plus citizen empowerment - aims to bridge the geographic and socio-economic digital divide, although significant challenges remain: as of early 2023, 31,8% of the Ghanaian population still does not use the internet, mainly due to cost factors, skills gaps or perceived lack of relevance. The government recognises that it will need to maintain subsidies and targeted programmes to connect this offline segment, improve affordability (the cost of mobile data service, while among the lowest in Africa, remains high for the average income of rural youth) and build the confidence of new users in digital technologies.

- Modernising ICT infrastructure

To support the growing digital ecosystem, Ghana has invested substantially in upgrading its connectivity and computing infrastructure. One of the outstanding achievements is the expansion of the national fibre optic backbone network: some 3.500 km of fibre cable were installed in 2023 alone, connecting 951 public institutions (government offices, schools, hospitals) to a high-speed broadband network.

This e-Government network, deployed with support from partners such as Huawei and the World Bank, not only enables faster online government procedures, but also acts as a backbone for private operators to extend high-capacity internet to nearby communities. Ghana also currently hosts the only Tier IV data center in West Africa, guaranteeing robust and secure cloud services for government and businesses.

In addition, there are several Tier III data centers in Ghana, a sign of the maturity of the country's digital infrastructure. On the mobile telecommunications front, the authorities have worked with operators to achieve almost universal 3G/4G coverage in the country, encouraging tower sharing and investment in LTE technology. While the reliability and cost of these access points still have room for improvement, Ghana is already preparing for the next stage: the technology roadmap envisages the introduction of 5G networks and the expansion of its submarine cable capacity (the country is connected to several international cables, taking advantage of its Atlantic coastline). However, electricity and other basic

services remain a critical factor: Ghana has achieved relative electrical stability compared to previous years, but ensuring quality energy in rural areas is key to the smooth functioning of ICT infrastructure. For this reason, initiatives such as rural base stations with solar panels (from the Rural Star project) are innovative and necessary.

In short, the modernisation of digital infrastructures - fibre backbone, data centers, mobile networks and energy - is an essential component of government policies, as without this physical base the digital economy cannot thrive.

- Digitalisation in strategic sectors (government, education, health, agriculture):

Ghana has sought to apply technology to transform its most important productive and public service sectors, seeking efficiency gains and improved quality of life for the population. In the public sector, as mentioned, a large part of the procedures have been moved to electronic platforms. Of particular note is the success of the Ghana.gov platform, which integrated more than 30 government services online, allowing citizens to make electronic payments of fees and taxes in a centralised manner.

The adoption of mobile payments in public services (through mobile money and card integrations) has increased revenue collection and minimised revenue leakage, supporting the government's goal of formalising the economy and moving towards a less cash-dependent society.

Likewise, the digitisation of registers (land, civil, health) is helping to clean up data, combat fraud and provide unified databases for national planning. One example is the interconnection of the Birth and Death Registry with the databases of the Health Service, the National Identification Authority and other agencies, achieving consistency in the country's demographic information.

Thousands of interconnected CCTV cameras have also been installed in major cities (Accra, Kumasi, Tamale) with police command centers, improving citizen security through digital surveillance.

In education, digital transformation has accelerated in recent years. The government has implemented a free Wi-Fi programme in schools, connecting around 700 secondary schools, 46 teacher training colleges and 13 public universities to broadband internet. This access has facilitated the adoption of online learning tools and expanded the educational resources available for students and teachers.

In addition, 350.000 laptops were distributed to secondary school teachers as part of the "One-Teacher One-Laptop" project, providing education staff with the technological means to prepare lessons, assess on digital platforms and access up-to-date teaching content.

The combination of connectivity and infrastructure (devices) is laying the foundation for a more digital education. During the COVID-19 pandemic, these investments at least partially enabled pedagogical continuity through virtual classes and online materials. However, challenges remain, such as training teachers in digital pedagogies and ensuring devices for poor students. Going forward, Ghana seeks to strengthen school-based digital skills training by including programming and media literacy in curricula, as emphasised in the "Digital Skills and Research" pillar of its Digital Economy Strategy.

In the field of health, Ghana has gained global recognition for cutting-edge technological innovations. One notable case is the use of drones to deliver medical supplies: in partnership with the firm Zipline, the Ministry of Health implemented an aerial delivery system that delivers urgent blood bags and medicines to rural clinics in a matter of minutes, saving lives in remote communities. This project, pioneered in Africa, was scaled up nationally and has made Ghana a model for how technology solves last-mile health problems. In addition, digital renewal of national health insurance was introduced using USSD code, so that citizens can update their health coverage from their mobile phones without the need for face-to-face procedures.

Another recent initiative is the creation of the National e-Pharmacy Platform (e-Pharmacy), the first nationwide in sub-Saharan Africa. This platform will integrate pharmacies across the country into an online system where patients will be able to search for drug availability in different pharmacies, compare prices and place electronic orders with digital prescriptions. At the same time, health authorities will be able to monitor drug dispensing in real time to detect counterfeit medicines and better regulate supply.

e-Pharmacy, together with electronic health records in pilot hospitals and telemedicine (which is being phased in for remote consultations), are part of Ghana's "Digital Health" vision to improve the efficiency and reach of health services.

In agriculture, a sector that employs a large part of the population, the government is promoting the adoption of digital solutions to increase farmers' productivity and income. Under the Ghana Digital Acceleration Project (mentioned above), the adoption of data-driven digital agriculture for small-scale producers is expected to be facilitated.

This involves the use of mobile platforms to disseminate local weather forecasts, personalised fertiliser/planting recommendations and real-time market prices, so that farmers can make informed decisions. Several AgriTech startups are already operating in Ghana that, with public support, address rural challenges: for example, mobile payment apps for unbanked farmers (eliminating intermediaries in the value chain), traceability and logistics systems to bring products to market, or digital marketplaces that directly connect agricultural supply and demand.

The government, through the Ministry of Agriculture and international partners (such as the Alliance for Digital Agriculture in Africa), is supporting these efforts with rural ICT training and subsidies for smartphones or basic sensors in farming communities. The expectation is that the digitisation of agriculture will contribute to improving food security and bringing formerly informal producers into the formal economy (for example, through platforms, a farmer's harvest can be historically recorded, making it easier for them to access credit from banks by having verifiable production data).

In short, Ghana is integrating digital transformation across all priority areas: from more efficient and transparent government, to higher quality education and health, to smarter and more connected agriculture. These initiatives not only raise domestic competitiveness and well-being, but also strengthen Ghana's position in the fourth industrial revolution at the regional level. Importantly, many of these programmes are carried out in collaboration with international partners (World Bank, UN, African Union through Smart Africa, German GIZ cooperation, etc.), bringing global funding and expertise to the national effort.

Despite the wide range of policies and initiatives described above, Ghana faces significant challenges in consolidating its digitisation. One of these is closing the access gap that still persists: while virtually the entire country has mobile coverage, about a third of Ghanaians do not use the internet regularly.

The reasons range from lack of basic digital skills to affordability - the cost of devices and internet can represent a high portion of income for the poorest households, and while mobile data prices have come down (≈ 2 USD per 1GB) they remain a barrier for many unemployed youth. Addressing this issue will require expanding community telecentre programmes, connectivity subsidies and mass digital literacy training. Another challenge is to ensure the financial and political sustainability of digital projects. Ghana's economy has struggled (especially in the aftermath of the pandemic and macroeconomic shocks).

This could limit the resources available for continued investments in ICT and innovation. The long-term success of the digital agenda will depend on maintaining the priority on these projects and attracting more private investment to complement them. It is also crucial to strengthen specialised human capital: although there is progress in training, the demand for software engineers, data scientists, cybersecurity experts and other digital profiles continues to outstrip local supply. Training initiatives such as MEST and Ghana Tech Lab help, but they need to be integrated with the formal education system and curb the drain of tech talent abroad.

Finally, at the institutional level, Ghana needs to strengthen inter-agency coordination and ongoing regulatory updates. Rapid technological evolution poses challenges such as data protection in the era of big data (the National Data Strategy is already being worked on), regulation of new industries (fintech, crypto, artificial intelligence) and the need for flexible legal frameworks that allow innovation without sacrificing security. Full implementation of the Startups Act once passed, strict compliance with the Data Protection Act by businesses, and adaptation to the AfCFTA (African Free Trade Area) Digital Protocol will be immediate tasks on the government's digital agenda.

In conclusion, Ghana has shown strong political leadership and numerous concrete programmes to drive digitalisation as a lever for economic development. The strategic vision is clear - to turn Ghana into an inclusive, innovative and globally competitive digital country - and important foundations have been laid in infrastructure, institutional framework and technology adoption.

The remaining challenges are not minor, but with policy continuity, private sector engagement and support from the international community, Ghana is well positioned to achieve a comprehensive digital transformation in the coming years, similar to or beyond that already undertaken by model countries in the region. The Ghana case illustrates how focused and sustained government policies can catalyse a vibrant digital ecosystem capable of generating economic growth, quality employment and innovation for sustainable development.

4. Digital skills analysis

4.1. Mapping digital skills needs in Ghana

Digital transformation in Ghana has gained momentum in recent years, highlighting the importance of digital skills training to enhance employability, especially in the technology small and medium-sized enterprise (SME) sector.

However, the shortage of professionals with advanced digital skills results in difficulty in recruiting staff with digital skills, especially advanced ones, the persistence of the urban digital divide, between the rural and urban world, especially between the capital Accra and the northern regions, and a decline in the productivity and competitiveness of the Ghanaian economy and its ICT sector in particular.

According to the Ghana Industrial Skills Gap Survey 2023 report which indicates that 59% of technology companies identify digital skills deficit as one of the barriers to expansion with 43% indicating that they find it difficult to find staff with advanced digital skills set out in the table above. On the other hand, the 2024 National ICT Sector Employment Survey prepared by the Ministry of Communications and Digitisation indicates that 35% of vacancies in local tech companies remain open for more than four months due to a lack of candidates with the advanced skills demanded by companies.

The acceleration of digital transformation in Ghana is increasing the demand for digital skills in sectors such as fintech, e-commerce, digital health and digitisation of government skills. The Ghana Digital Economy Policy and Strategy 2024 by the Ministry of Communication and Digitisation wants at least 70% of the working age population to acquire basic digital skills by 2030 and 30% of youth to acquire advanced digital skills - especially in cybersecurity, programming, data science and AI - by the time they complete secondary or tertiary education.

The Ghanaian labour market demands digital skills that can be grouped into three main categories: basic skills, intermediate skills and advanced skills, all of which are necessary for the digital transformation of key sectors such as commerce, agriculture, health and public administration.

- 1 Basic digital competences: these include fundamental skills such as handling digital devices, surfing the internet, managing online information, using digital communication tools (email, social networks) and basic cybersecurity knowledge. These skills are essential for integration into the digital society and for the adoption of online education and work platforms.
- 2 Intermediate digital skills: these cover the use of advanced office software, digital collaboration tools, basic data analysis and management of online platforms for business. These skills are increasingly required in sectors such as commerce, industry and entrepreneurship, where digitisation improves productivity and operational efficiency.
- 3 Advanced digital skills: these include skills in programming, data analytics, artificial intelligence, cybersecurity, application development and network management. The shortage of professionals with these skills represents a challenge for Ghana's technology sector as it seeks to establish itself as an innovation hub in West Africa.

At the sectoral level, digitisation is impacting various areas of the Ghanaian economy:

- Agriculture sector: the increasing adoption of digital technologies in
- agriculture requires skills in the use of mobile applications for market
- access, weather forecasting and farm management tools.

Financial sector: The rise of digital banking and fintech services has generated high demand for experts in digital security, data-driven financial analytics and electronic payment platform management.

Health sector: the implementation of telemedicine and the digitisation of medical records has increased the need for training in digital health platforms and medical data protection.

Despite the growth of internet access and mobile device penetration in Ghana, digital skills gaps remain a significant barrier to leveraging digitisation across all sectors.

4.2. Skills gaps in the technology sector

Ghana's technology sector faces a significant digital talent deficit, limiting its competitiveness in the global digital economy. While digitisation is advancing rapidly and businesses are increasingly demanding technology professionals, digital skills training has not grown at the same pace, creating a significant gap between educational supply and labour market demand.

This gap is due to several structural and educational factors, including a shortage of ICT graduates, a lack of alignment between academic programmes and industry needs, a shortage of talent in key areas such as artificial intelligence and cybersecurity, and the emigration of highly skilled professionals to international markets.

The following are the main challenges that explain this problem:

A. Lack of ICT graduates

The number of graduates in technology disciplines is insufficient to meet the growing demand for professionals in the digital sector. According to recent data, less than 5% of university students in Ghana are enrolled in ICT-related programmes, which is significantly lower compared to other emerging countries with growing digital economies.

Although universities such as the Kwame Nkrumah University of Science and Technology (KNUST) and the University of Ghana offer degrees in computer science, software development and telecommunications, the number of graduates is not sufficient to meet market demand. This forces many companies to train their employees in-house, which is an additional cost and slows down the adoption of new technologies in the country.

In addition, vocational and technical ICT training (TVET) programmes have not yet reached a sufficient scale to train workers in key digital skills, leaving a large part of the population without access to digital training opportunities.

B. Advanced skills shortage

Beyond the lack of graduates, there is a large deficiency in advanced skills, which represents a significant barrier to the development of Ghana's technology ecosystem.

Technology and fintech companies in the country report difficulties in finding talent in critical areas such as:

- Software development and advanced programming (Python, Java, React, Angular).
- Data science and big data analysis.
- Cybersecurity and data protection.
- Cloud computing and network management.
- Artificial intelligence and automation.

Many local companies have to resort to hiring foreign talent or outsourcing technology services outside the country due to the lack of qualified personnel locally.

This affects not only technology companies, but also other sectors that require these advanced digital skills, such as banking, telecommunications, healthcare and e-commerce.

C. Outdated educational programmes

Curricula at universities and vocational training centers in Ghana are not aligned with the needs of the labour market, which reduces the employability of graduates.

Some of the main problems in the education system include:

- Theoretical rather than practical approach: many university programmes in ICT follow a traditional model, with little integration of project-based learning and simulations of the real working environment.
- Little curricular updating: ICT teaching in many institutions has not evolved to include new technologies such as artificial intelligence, blockchain or data analytics, leaving graduates with outdated skills.
- Lack of technological infrastructure: many universities and training centers lack access to modern computer labs and stable internet connections, making it difficult to teach advanced technical skills.

In response to these challenges, some institutions have begun to reform their educational programmes with support from the private sector and international organisations. For example, Microsoft and Cisco have established ICT training programmes in universities and technical centers in Ghana, but these efforts are still insufficient to close the digital skills gap.

D. Talent drain and retention difficulties

Another major challenge for the technology sector in Ghana is the digital talent drain. Professionals with advanced ICT skills are in high demand in other markets, causing many skilled workers to seek opportunities abroad or in Ghana-based multinational companies that can offer better salaries and working conditions.

This has created a situation where tech startups and SMEs in Ghana cannot compete with the salaries offered by international companies, limiting their ability to grow and innovate.

The main reasons behind the talent drain include:

- Salary differentials: tech professionals can earn up to three times more in countries such as the US, UK or Canada.
- Lack of incentives for retention: Many Ghanaian companies do not offer ongoing training schemes, certifications or additional benefits that incentivise professionals to stay in the country.
- Limited opportunities for growth: Unlike other countries, Ghana still has a developing technology ecosystem, which limits opportunities for specialisation in advanced areas such as artificial intelligence or cybersecurity.

To mitigate this problem, some African governments have developed brain gain strategies, offering tax incentives and funding opportunities for tech professionals to return to work in their home countries. Ghana could explore similar initiatives to retain and attract digital talent.

E. Impact on the country's competitiveness

The lack of digital talent directly affects Ghana's ability to attract foreign investment in the technology sector and develop a competitive digital ecosystem.

Tech startups in the country struggle to grow due to a lack of professionals with key skills, which reduces their ability to innovate and scale. In addition, the shortage of talent prevents the country from seizing opportunities in emerging industries such as:

- Fintech and digital banking.
- Health technologies (e-health and telemedicine).
- E-commerce and digital platforms.
- Agri-tech and digitisation of agriculture.

Without a strong digital talent base, Ghana risks being left behind in the Fourth Industrial Revolution, while other African countries such as Nigeria, Kenya and South Africa make progress in developing their digital economies.

To address these gaps, it is critical to strengthen ICT training through a holistic approach that combines efforts from government, the private sector and the education system. Some recommended strategies include:

1. Reforms in technical and university education.

- o Update ICT curricula to include artificial intelligence, cybersecurity and cloud computing.
- o Encourage project-based teaching and hands-on training in modern laboratories.
- o Integrate international certifications (Cisco, Microsoft, AWS) into university curricula.

2. Promote inclusive digital education

- o Expand access to technical training in rural areas.
- o Offer ICT training programmes for women and young people at risk of digital exclusion.

3. Capacity building and accelerated training programmes

- o Promote coding academies and intensive bootcamps in digital skills.
- o Create dual training programmes where students work in companies while they learn.

4. Incentives for talent retention

- o Offer tax benefits and funding for tech startups that hire local talent.
- o Develop policies to reduce brain drain, such as career paths and access to advanced training within the country.

With these initiatives, Ghana will be able to reduce the digital skills gap, improve its competitiveness in the global digital economy and strengthen its tech ecosystem to drive the country's economic and social development.

4.3. Mismatch between skills demand and supply

The mismatch between digital skills training and the needs of the labour market in Ghana represents one of the main obstacles to the consolidation of its digital economy. While the productive sector demands professionals with advanced skills in technology, most educational and technical training programmes have not yet been able to adapt to the speed of technological change. This has led to a significant gap between the supply of available talent and the real needs of companies, which affects the country's competitiveness in the digital sector.

The main factors contributing to this mismatch and their implications are detailed below:

Outdated educational programmes.

The Ghanaian education system has not updated its ICT training programmes fast enough to align with labour market trends. Although universities and technical colleges have begun to incorporate technology courses, several structural challenges remain:

- Predominantly theoretical approach: many universities follow a traditional teaching model, with little integration of hands-on learning and project-based methodologies. This leaves graduates with conceptual knowledge, but no applied skills in real work environments.
- Lack of curriculum updates: Curricula do not reflect advances in key areas such as artificial intelligence, data analytics, cybersecurity and cloud computing. As a result, graduates often lack training in advanced digital tools that companies are looking for.
- Deficiency in ICT teacher training: Most lecturers who teach technology courses do not have continuous training in new technologies, which limits their ability to deliver education aligned with market requirements.

Higher education institutions in Ghana have begun to recognise this issue and implement measures to update their curricula, but the pace of change remains slow compared to the speed at which the digital industry is evolving.

Poor practical training and employability gap

The Ghanaian labour market demands professionals who not only have theoretical knowledge in ICT, but also have practical experience in implementing and developing digital solutions.

However, most graduates lack this practical preparation, which makes it difficult for them to enter technology jobs.

Some of the reasons for this lack of applied training include:

- Shortage of laboratories and technological equipment in universities and training centers: many institutions do not have adequate infrastructure for students to develop practical skills in programming, data analysis or network administration.
- Low supply of internships and dual training programmes: There are few opportunities for students to undertake internships in technology companies during their studies. In Ghana, less than 30 % of technology students access an internship before graduation, in contrast to more integrated education models in countries such as Germany or Canada.
- Disconnect between technical training and international certifications: While companies seek employees with technology certifications (e.g. Microsoft Azure, AWS, Cisco, Google Cloud), most university programmes do not integrate these certifications into their curricula.

This deficit of practical training has a direct impact on the employability of ICT graduates, as many companies prefer to hire foreign talent or outsource their technology services rather than invest in training new employees.

Weak connection between the private sector and the education system

The lack of collaboration between technology companies and educational institutions is another key factor in the mismatch between the supply and demand of digital talent in Ghana. In many cases, universities design their curricula without consulting industries about their needs, leading to a misalignment between the skills being taught and those actually sought by employers.

Some of the problems related to this disconnect include:

- Little industry involvement in curriculum design: unlike in other countries where companies play an active role in defining educational programmes, in Ghana the ICT industries have little influence on the formulation of curricula in universities and training centers.

- Lack of incentives for university-industry collaboration: There are insufficient policies to encourage strategic partnerships between educational institutions and businesses to foster technology training. This has caused many universities to operate in isolation, without considering the changing needs of the labour market.
- Low investment in technical education by the private sector: Although many technology companies in Ghana face difficulties in finding talent, few have developed in-house training programmes in partnership with universities or training centers.

In response, some companies have begun to implement technology training and certification programmes, but their reach remains limited.

The mismatch between the demand and supply of digital skills has a direct impact on Ghana's ability to develop its digital ecosystem and compete in the global economy. Some of the main consequences include:

- Difficulties for tech startups to grow: many startups in Ghana are unable to scale their operations because they cannot find enough local digital talent. This limits the country's ability to become an innovation hub in West Africa.
- Increased reliance on foreign talent and outsourcing of services: the lack of skilled ICT professionals has led several companies to resort to hiring foreign experts or outsourcing technology projects outside the country, representing a loss of job opportunities for Ghanaians.
- Low competitiveness in key digital industries: Sectors such as fintech, e-commerce and telecommunications require a highly skilled workforce to sustain their growth. However, a shortage of digital talent is holding back the development of these strategic sectors for the country's economy.

To close the gap between ICT training and labour demand in Ghana, a number of reforms and strategies need to be implemented to better align the education system with the needs of the productive sector. Some of the most relevant initiatives include:

1. Modernisation of ICT education programmes

- Review and update curricula in universities and technical training centers to include emerging trends such as artificial intelligence, cybersecurity and data analytics.
- Integrate internationally recognised certifications into training programmes, such as Cisco, Microsoft, AWS and Google Cloud.
- Include project-based learning methodologies and encourage real-world problem solving in educational settings.

2. Greater investment in practical training and internships

- Expand dual training programmes, combining classroom learning with internships in technology companies.
- Encourage the creation of more computer labs in universities and technical training centers.
- Encourage partnerships between companies and universities to offer internships and mentoring to ICT students.

3. Promote collaboration between the private sector and the education system.

- Establish forums and platforms for dialogue between universities, business and government to define joint ICT training strategies.
- Create tax incentives for technology companies to invest in training local talent.
- Develop specific training programmes for technology start-ups and entrepreneurs.

4. Expand access to online education and technology bootcamps.

- Encourage the use of digital education platforms to provide accessible and flexible ICT training.
- Support intensive bootcamp initiatives that train workers in key areas such as programming and cybersecurity in less than six months.

If these strategies are effectively implemented, Ghana can bridge the gap between education supply and labour demand, strengthening its digital ecosystem and improving the competitiveness of its economy in the digital age.

4.4. Current training programmes and future needs

Digitisation and technological transformation are redefining the labour market in Ghana, driving the need to strengthen Information and Communication Technology (ICT) training. In response to this challenge, the country has implemented various initiatives to develop the digital skills of its population, combining government efforts, technical and vocational education and training (TVET) programmes, and initiatives from the private sector and international cooperation.

In this context, the government has promoted the modernisation of vocational education and training systems, facilitating access to digital training through specialised centers, online learning platforms and strategic alliances with technology companies. At the same time, programmes have been launched to foster digital entrepreneurship and the growth of the technological ecosystem, strengthening incubators, accelerators and innovation spaces.

However, despite this progress, significant challenges remain, such as the lack of equitable access to digital education in rural areas, the shortage of practical training in advanced skills and the need to update educational curricula to align them with market demands. For Ghana to consolidate its digital transformation, it will be critical to strengthen training programmes in strategic sectors such as health, agriculture and commerce, as well as to ensure greater inclusion of women and youth in technology training.

ICT technical and vocational education and training (TVET) programmes

Ghana is modernising its technical and vocational education and training (TVET) system to align it with current digital needs. In 2012, the Ghana Skills Development Initiative (GSDI) was launched, incorporating elements of the German dual model to combine on-the-job training with classroom modules in selected centers. The government implements a five-year strategic plan that includes new legislation to consolidate TVET institutions under the Ministry of Education, improve coordination and update curricula.

With support from partners such as GIZ (Germany), innovative programmes are introduced such as the Ghana TVET Voucher Project (GTVP), which with €10 million in funding provides training vouchers in technical and digital trades to facilitate access to practical training. Ghana also organises national technical skills competitions (WorldSkills Ghana) to motivate young people and raise the profile of vocational training.

In terms of infrastructure, the government is committed to establishing at least two state-of-the-art vocational training centers in each region, equipped with modern machinery and tools for all levels of training.

These efforts are aimed at ensuring that technical training in the region is provided at all levels of education and training. These efforts aim to make ICT technical training more attractive, relevant and linked to the world of work, following the dual model with strong business involvement.

Training programmes in Information and Communication Technologies (ICTs)

The country is promoting multiple initiatives to improve the digital skills of the population, both in the public and private sectors. An outstanding example is the government's "One Million Coders" programme, launched in collaboration with the telecommunications company MTN, aimed at training one million young people in programming and emerging digital skills such as artificial intelligence and cybersecurity. This programme is part of the national digital transformation strategy and includes the creation of centers of excellence in AI and software development.

On the other hand, the Girls-in-ICT initiative focuses on reducing the gender gap in technology: since 2012 it has trained almost 14.000 girls and women in basic computer science and coding skills. In 2024, a specific trust (Girls-in-ICT Trust) was created to scale the programme, with the goal of training more than 9.000 girls each year through workshops, coding camps and mentoring. This initiative, sponsored by the Ministry of Communications and Digitalisation, also trains teachers and provides equipment (such as laptops and labs) to outstanding schools.

Academies and programmes to develop digital talent are emerging from the private sector. For example, the company MTN launched the MTN Skills Academy, a platform of free online courses in coding, web development, digital marketing, data analytics and digital finance, with the goal that at least 60% of youth and adults will acquire basic digital skills by 2025. Other initiatives include coding academies such as the Soronko Academy, aimed at young women, and programming and data analytics bootcamps offered by local startups, which complement the traditional training offer.

Digital entrepreneurship support programmes

Ghana recognises that to foster technological innovation, technical training is not enough; dynamic entrepreneurial ecosystems are needed. For this reason, there are various incubation, acceleration and funding programmes for technology start-ups. At the government level, the National Entrepreneurship and Innovation Programme (NEIP) offers business training, incubation support and seed funding to entrepreneurs in sectors such as ICT, manufacturing and agriculture.

Several innovation centers and technology hubs have been established from the private sector and cooperation. For example, the Accra Digital Centre (ADC), a technology park managed by Ghana Digital Centers Ltd, hosts technology companies and incubation programmes. This center provides infrastructure and a suitable environment for startups, as well as running digital skills training programmes in partnership with experts. Other hubs such as MEST Africa, Impact Hub Accra, Ghana Innovation Hub and Kumasi Hive offer coworking spaces, mentoring and access to investor networks.

Education modernisation and e-learning programmes

In recent years, Ghana has embarked on strategies to digitise education and prepare students and teachers for the digital age. Already in 2015, the ICT in Education Policy (ICT4AD Policy) was approved, which emphasises the integration of technology in education and the training of teachers in digital skills. In 2023, with support from UNESCO, Ghana developed a National ICT Competency Framework for Teachers, which defines standards from basic to advanced level to ensure that all educators are able to use digital tools in their classrooms.

The COVID-19 pandemic accelerated the adoption of e-learning. During 2020-2021, the Ministry of Education in collaboration with UNESCO provided emergency training in remote teaching to more than 400 secondary school teachers. In parallel, digital education platforms such as iCampusGH, which allowed secondary school students to access virtual materials and simulations, were promoted. The Centre for National Distance Learning and Open Schooling (CENDLOS), which develops multimedia educational content and has deployed mobile classrooms with technological equipment to facilitate teaching in rural areas, was also strengthened.

Training programmes in strategic sectors

Ghana is developing sectoral digital skills training programmes focused on key areas such as health, agriculture and trade.

- Health: e-Health projects are implemented, such as the national Telemedicine programme, which connects doctors and nurses in rural communities with specialists through digital platforms. Also, the Ghana College of Nurses and Midwives offers accredited online courses on digital healthcare and electronic health record management.
- Agriculture: Initiatives such as SAT4Farming and Esoko provide farmers with training in the use of digital technologies to improve production and access to markets. Through mobile applications and technical advice, thousands of small producers have adopted digital tools to optimize their work.

- Trade and business sector: programmes such as Digital Transformation for Inclusive Entrepreneurship in Ghana (DTEG) train microenterprises in e-commerce and digital finance, helping traditional businesses to digitise their operations and access new markets.

International cooperation projects in digital skills

Support from international agencies has been instrumental in the development of digital skills training in Ghana. Through programmes funded by multilaterals, bilaterals and aid agencies, the country has been able to improve educational infrastructure, expand technical training and strengthen its digital ecosystem. These initiatives focus on closing the digital skills gap, boosting youth employment and fostering digital inclusion in strategic sectors.

A. World Bank: Ghana Jobs and Skills Project and eTransform Ghana

The World Bank has been one of Ghana's key partners in transforming its education and skills training system. In 2020, it approved a \$315 million package for programmes focused on employment, skills development and digitalisation. Within this framework, two projects have been key:

1. Ghana Jobs and Skills Project (GJSP):

- This \$200 million programme aims to improve access to technical and vocational training (TVET) and increase employment opportunities for young Ghanaians.
- Training programmes in digital and entrepreneurial skills have been implemented to prepare beneficiaries for emerging sectors.
- In addition, it provides grants to entrepreneurs and small technology companies, facilitating their access to finance for the digitisation of their businesses.
- It also supports the modernisation of the Labour Information System in Ghana, facilitating the connection between employers and skilled professionals.

2. eTransform Ghana:

- With an investment of \$115 million, this project aims to accelerate the digitisation of government services, improve connectivity in rural areas, and strengthen digital skills training.

- It finances the modernisation of 200 secondary schools and two universities, equipping them with computer labs and access to digital education platforms.
- Supports the digitisation of public registries, which facilitates access to government services online.
- Promotes the training of public officials in digital skills to improve service delivery in sectors such as health, education and public administration.

These programmes have improved educational infrastructure and ICT training in Ghana, benefiting thousands of young people, entrepreneurs and public sector workers.

B. European Union: EU-Ghana Pact for Skills

The European Union (EU) has played a crucial role in the development of digital skills in Ghana through the EU-Ghana Pact for Skills, an initiative launched in 2022 as part of the EU's Global Gateway programme.

- With a budget of €30 million, this programme aims to train thousands of young Ghanaians in digital and sustainable skills, aligning training with the demands of emerging sectors such as technology, renewable energy and advanced manufacturing.
- The programme takes a holistic approach, combining technical training with employability and entrepreneurship support.
- It is based on a close partnership between the Government of Ghana, the private sector and EU agencies, ensuring that the training responds to the needs of the labour market.
- It also supports the expansion of vocational training in rural areas, ensuring that remote communities have access to digital training opportunities.

The EU-Ghana Pact for Skills represents a strategic EU commitment to strengthen Ghana's competitiveness in the global digital economy by promoting the inclusion of youth and women in technological development.

German Cooperation (GIZ) and Luxembourg Cooperation Agency (Lux-Dev)

The German government, through the GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit), has played a key role in modernising technical training in Ghana.

- Ghana Skills Development Initiative (GSDI):
 - Programme implemented since 2012, funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) and the Swiss government.
 - It introduced the dual training model in Ghana, combining classroom learning with practical experience in technology and manufacturing companies.
 - It trains trainers and improves the curricula of TVET institutions, ensuring their alignment with the needs of the digital labour market.
- Ghana TVET Voucher Project (GTVP):
 - A €10 million project to improve technical skills in strategic sectors, including digital skills.
 - It provides training vouchers to young people to access courses at technical institutes and innovation centres.
 - It has benefited thousands of apprentices, helping to close the skills gap in the country.

C. Luxembourg Cooperation Agency (Lux-Dev)

The Luxembourg Cooperation Agency (Lux-Dev) has also contributed to strengthening digital literacy in Ghana.

- It has funded the development of technical education and vocational training programmes in ICT.
- It supports the modernisation of innovation centres and technology hubs, providing spaces for the training of digital entrepreneurs.
- It collaborates with incubators and accelerators of technology startups to foster the growth of the country's digital ecosystem.

Other international partners in digital training in Ghana

In addition to initiatives led by the World Bank, the EU, GIZ and Lux-Dev, other multilateral agencies have supported ICT training in Ghana:

- UNESCO has worked on the creation of a National Digital Competency Framework for Teachers, ensuring that teachers are trained in digital tools for teaching.
- The United Nations Development Programme (UNDP) has supported digitisation projects in public administration and digital skills training for youth.

The Korea International Cooperation Agency (KOICA) has funded the creation of technology training centers in several regions of Ghana, focusing on software and data analytics training.

- USAID has supported digital literacy initiatives and e-commerce training for small entrepreneurs and farmers.

International cooperation projects have significantly expanded ICT training in Ghana, benefiting thousands of students, workers and entrepreneurs. However, important challenges remain to be addressed:

- Lack of access in rural areas: although inclusive programmes have been developed, many communities still lack access to quality digital training.
- Sustainability of programmes: many of these initiatives depend on external funding, which poses the challenge of ensuring their long-term continuity.
- Constant updating of curricula: There is a need to ensure that ICT training remains aligned with global trends and labour market demands.
- Greater involvement of the private sector: Increased collaboration between businesses and the education system will develop more specialised skills and improve the employability of graduates.

To consolidate its digital transformation, Ghana must strengthen the integration of these programmes into its national development strategy, ensuring that international cooperation continues to play a key role in training its workforce.

Future needs and strategies for improvement

Despite progress, Ghana must continue to expand digital literacy, update educational curricula, strengthen university-business collaboration and encourage more hands-on training programmes. Investment is needed in cybersecurity, artificial intelligence, big data and cloud computing, as well as more incentives for retaining digital talent in the country. With a comprehensive training strategy, Ghana will be able to consolidate its digital transformation and position itself as a leader in the West African digital economy.

4.5. Sectors driving demand for digital skills in Ghana

The increasing digitisation of the Ghanaian economy is driving significant demand for digital skills training in key sectors. Education, health, agriculture and commerce are strategic areas where technology is transforming production and operational processes, generating an urgent need for specialised digital training. Each of these sectors faces unique challenges in terms of ICT adoption and requires training programmes tailored to their specific needs:

A. Education: the digitisation of learning and ICT teacher training.

Education is one of the sectors with the highest demand for digital skills in Ghana, as the incorporation of ICT in the classroom has become a national priority. The government's digitisation strategy for education aims to ensure that students develop digital skills from an early age and that teachers are prepared to integrate technology into their teaching.

Some of the factors driving this demand include:

- ICT training for teachers: with the introduction of the *National ICT Competency Framework for Teachers* in 2023, a standard has been set for educators to acquire essential digital skills, from the basic use of digital tools to the production of online educational content.
- Digital education platforms: Programmes such as *iCampusGH* and *eTransform Ghana* have promoted access to digital education resources, but many teachers still need training to make the most of these platforms in teaching.
- Technology infrastructure in schools: The expansion of computer labs and internet access in educational institutions has generated demand for training in hardware, educational software and digital security.

- Distance and blended learning: With the COVID-19 pandemic, the need for training in online teaching accelerated, and the demand for training in tools such as Moodle, Google Classroom and Zoom continues to grow.

To address these challenges, government and international agencies have launched training programmes for teachers and students, promoting the adoption of digital methodologies and the integration of technology into the school curriculum.

B. Health: digitisation of services and expansion of telemedicine

The health sector in Ghana has made significant progress in the digitisation of services, driving demand for training in the use of digital tools for clinical data management, telemedicine and health information analysis.

Some of the key areas requiring digital training include:

- Telemedicine and remote consultations: with the implementation of the national Telemedicine initiative, platforms have been created that connect doctors and nurses in rural communities with specialists. However, in order to function efficiently, health professionals need to be trained in the use of these digital tools.
- Digital health record management: The adoption of electronic health record (EHR) systems requires health workers to learn how to manage patient databases, ensure information security and use interoperable platforms.
- E-learning for healthcare workers: the growing supply of accredited online courses for doctors and nurses, such as those developed on the *World Continuing Education Alliance (WCEA)* platform, has driven the need for training in digital learning and management of online educational resources.
- Use of artificial intelligence in medical diagnostics: With the introduction of AI-based tools for disease detection, healthcare professionals need to be trained in the interpretation and application of these systems in clinical practice.

Organisations such as the World Bank and the Novartis Foundation have funded digital health initiatives in Ghana, including training health workers in the use of emerging technologies. Digital empowerment in this sector not only improves the efficiency of the health system, but also expands access to quality medical services in rural and urban communities.

C. Agriculture: Digital transformation of the agricultural sector

Agriculture remains a key pillar of Ghana's economy, and digitalisation is revolutionising the way farmers manage their crops and market their produce. The adoption of technologies such as mobile apps, smart sensors and data analytics has led to a growing demand for training in digital tools for workers in the agricultural sector.

The main factors driving this need include:

- Use of mobile apps in agricultural production: platforms such as *SAT4Farming* and *Esoko* allow farmers to receive advice on good agricultural practices, weather forecasting and market prices. However, many producers require training in the use of these applications.
- Crop monitoring with sensors and drones: Precision agriculture is gaining ground in Ghana, but its effective implementation depends on training farmers and technicians in the installation and analysis of data from sensors and drones.
- Digital marketing of agricultural products: the adoption of e-commerce platforms and agricultural fintech allows farmers to sell their products without intermediaries. Training on these platforms is key to maximising their use and ensuring farm profitability.
- Data management and soil analysis: farmers need to develop skills in the use of soil analysis and crop planning software based on scientific data.

The Ghanaian government, in partnership with agencies such as FAO and USAID, has launched training programmes in digital agriculture to improve the productivity and sustainability of the sector. These initiatives seek to equip farmers with the necessary tools to take advantage of technology and optimise their operations.

D. Trade and financial services: boosting e-commerce and e-banking

The growth of e-commerce and digital payment systems in Ghana has driven demand for training in digital marketing, cybersecurity and online platform management. With the rapid expansion of fintechs and mobile payment solutions, more and more companies are looking for employees with advanced digital skills.

Key areas requiring training include:

- E-commerce and digital marketing: small and medium-sized enterprises (SMEs) need training in setting up and managing online shops, search engine optimisation (SEO) and digital advertising strategies to increase their visibility in the market.
- Digital payments and e-banking: With the growth of platforms such as *Mobile Money* and the rise of fintechs in Ghana, there is a growing demand for training in cyber security, financial data analysis and management of digital payment platforms.
- Cybersecurity and data protection: the digitisation of the financial sector has increased vulnerability to fraud and cyber attacks, making it imperative to train employees in security incident prevention and response strategies.
- Customer management on digital platforms: companies require training in the use of CRM (Customer Relationship Management) and customer service automation through chatbots and artificial intelligence.

In response to these needs, programmes such as the Digital Transformation for Inclusive Entrepreneurship in Ghana (DTEG) have provided training in digital commerce to entrepreneurs and SMEs. In addition, banks and fintech companies have developed digital finance training initiatives to improve financial literacy and digital inclusion in the country.

Ultimately, digitalisation is transforming multiple sectors in Ghana, generating a growing demand for specialised digital skills training. Education, health, agriculture and commerce are at the forefront of this transformation, with specific needs that require a strategic response from the education and vocational training sector.

To meet this demand, Ghana must continue to invest in sector-specific training programmes, fostering public-private partnerships and ensuring that training initiatives reach all segments of the population. The integration of emerging technologies and lifelong learning will be a key to ensuring that the country is prepared to compete in the global digital economy.

- Cybersecurity training programmes: more universities and TVET institutions are expected to offer specific programmes in IT security, including international certifications such as *Certified Ethical Hacker (CEH)* and *CompTIA Security+*.
- Artificial intelligence as a driver of innovation: Ghana is exploring the potential of AI in sectors such as health, education and agriculture. Programmes such as *One Million Coders*, driven by the government and companies such as MTN, seek to train young people in AI, machine learning and data analytics.

These emerging sectors present great opportunities for employment and economic development, so the country is expected to invest significantly in specialised training in these areas.

4. Greater emphasis on practical training and partnerships with the private sector

The mismatch between educational training and labour market needs has been a constant challenge in Ghana. To address this, a greater emphasis on practice-based training is envisaged, ensuring that graduates gain real-world experience before entering the labour market.

- Project-based learning and innovation labs: Educational institutions are beginning to integrate practical teaching methodologies, where students develop real technology projects in collaboration with companies.
- Internships and dual training programmes: more technology companies are expected to establish agreements with universities and technical training centres to offer internships and dual training programmes, combining theory and real-world experience.
- Tech incubators and accelerators: innovation hubs such as *MEST Africa* and *Ghana Tech Lab* will continue to play a key role in nurturing tech entrepreneurs, providing training and access to funding for startups.

Increased collaboration between the education sector and the private sector will ensure that digital skills training in Ghana is aligned with the needs of the labour market, improving the employability of graduates and the country's competitiveness in the digital economy.

The future of digital skills in Ghana will be determined by a combination of investment in digital education, expansion of online learning platforms, specialisation in cybersecurity and artificial intelligence, and increased collaboration with the private sector.

For Ghana to position itself as a leader in digital talent development in West Africa, it will be key to:

- 1 Ensure the inclusion of digital skills in formal education, preparing new generations from an early age.
- 2 Expand access to e-learning and digital training in rural communities, closing the access gap between urban and rural areas.
- 3 Promote specialised programmes in cybersecurity and artificial intelligence, aligned with the digital transformation of the economy.
- 4 Strengthen partnerships between universities, technical training centers and the private sector, ensuring that digital training responds to the real needs of the labour market.

With a comprehensive strategy and sustained commitment from the public and private sectors, Ghana will be able to take advantage of the digital revolution to generate employment, attract investment and consolidate its economy as a center of technological innovation in the region.

5. Level of business digitisation in Ghana

Over the past decade, Ghana has made significant progress in business digitisation, driven by government initiatives such as the *Ghana Digital Acceleration Project* and the *Ghana Digital Economy Policy*. However, challenges remain in the adoption of advanced digital technologies, especially among small and medium-sized enterprises (SMEs), which account for approximately 85% of the country's business fabric.

Ghana is currently at a tipping point: although digital infrastructure has improved and regulations have evolved to encourage digital transformation, access to finance, digital skills and the low adoption rate of advanced technology tools continue to constrain the growth of the digital business ecosystem.

5.1. Digital maturity by dimension

The digital maturity of businesses in Ghana can be assessed along five key dimensions: digital infrastructure and connectivity, adoption of digital tools, digital skills and training, digital security and regulation, and use of data and market analytics.

In digital infrastructure and connectivity, although Ghana has near-universal coverage of 3G and 4G mobile networks, 4G adoption remains low in rural areas, limiting equitable access to digital tools. There is an inequality in relation to mobile internet penetration and fixed internet access. While mobile internet penetration is robust with over 22 million mobile internet subscriptions by 2023, fixed internet access remains marginal. To redress these inequalities, the Ghana Digital Acceleration Project, funded with US\$200 million by the World Bank, in collaboration with the government is investing in the expansion of the national fibre optic network, to improve the efficiency of digital public services and enhance the digital innovation ecosystem. The deployment of 4.400 new 4G/5G towers is expected to enable the launch of the 5G network in the country by 2025.

The adoption of digital tools has picked up speed in large enterprises, especially the adoption of ERP solutions and e-commerce platforms for the digitisation of administrative and financial processes. E-commerce is also growing with more than 30 e-commerce platforms operating in the country, some as important as Jumia and Tonaton, but its adoption by SMEs to boost their sales is low, with 60% of SMEs relying on social networks and traditional methods to sell products and services.

In large enterprises, the digitisation of administrative and financial processes has advanced rapidly, with high adoption of ERP solutions and e-commerce platforms. E-commerce has grown with platforms such as Jumia and Tonaton, but 60% of SMEs still rely on social networks and traditional methods for selling products and services and 85% of online transactions are still cash on delivery, reflecting a lack of trust in digital payment systems. The use of limited technology and obsolete equipment also persists with 85% of manufacturing employment coming from SMEs using outdated technology.

A significant deficit also persists in the training and digital skills of the workforce. Despite government training initiatives that have benefited more than 15.000 people in recent years, only 25 per cent of the workforce has been trained.

population possesses basic digital skills while the percentage of the population with intermediate and advanced digital skills stands at 10%, indicating that efforts are still required to strengthen the acquisition of digital skills at all levels. The lack of talent in cybersecurity, data analytics and software development specialists limits the ability of companies to implement digital strategies, impacting their adoption of e-commerce platforms and digital payment systems in their transactions, as well as the purchase and good use of up-to-date technological systems.

The creation of the Cyber Security Authority and the National Communications Authority as well as the development of a digital regulatory framework through the Electronic Transactions Act and the Data Protection Act has strengthened the framework for digital security and regulation. However, enforcement of these regulations remains weak, and many companies are unaware of their data protection and digital security obligations.

Recognising that the use of market data and analytics, especially their implications for decision-making, is important, Ghana has created a government open data portal, although its development has been limited. Many SMEs still do not use either advanced analytics or big data in their operations, which reduces their ability to improve their competitiveness and efficiency.

5.2. Digital maturity by business sector

Digitalisation varies considerably by business sector. Sectors such as fintech and digital banking, commerce and retail, agriculture and agribusiness, and manufacturing and industry present both opportunities and challenges in terms of their digital maturity.

In fintech and digital banking, Ghana is one of the most advanced countries in Africa in terms of mobile payments, with over 23 million active users and 616.000 mobile money agents. The fintech ecosystem has grown exponentially, with high adoption of digital payments platforms and progressive integration of blockchain and digital currencies such as the eCedi. However, access to digital credit remains a challenge for many SMEs.

E-commerce and retail has grown, with platforms such as Jumia and Tonaton leading the market. However, 85% of online transactions are still cash on delivery, reflecting a lack of trust in digital payment systems. Even though many SMEs use social media for online payment, many are still using it as a means of payment.

Although many SMEs use social networks for selling products, the adoption of advanced e-commerce solutions remains low, as does the lack of integration with electronic payment systems, both reducing the efficiency of the sector.

The agriculture and agribusiness sector presents a mixed picture. While adoption of digital technologies remains low, with less than 10% of farmers using advanced digital technologies to optimise production, startups such as Esoko and Farmerline have started to implement digital solutions to increase productivity. Weak rural connectivity and lack of ICT training for farmers remain major barriers to the digitisation of the agricultural sector.

In the manufacturing and industrial sector, only a small percentage of companies have implemented automation and data analytics systems in production. Eighty-five percent of SMEs in the sector still use limited technology and traditional processes, while the main obstacle to digitisation is the lack of government incentives for industrial digitisation.

5.3. Challenges and obstacles to digitisation

The main challenges include limited access to finance, lack of digital skills and low trust in digital platforms. The evolving regulatory framework also presents challenges, especially in the taxation of e-commerce.

Only 30% of SMEs have access to bank loans for technology investment, and the lack of public-private investment funds restricts the growth of digital start-ups. As a result, there is a high dependence on informal finance and high interest rates for commercial loans that make it difficult for technology start-ups to scale their operations. There is also a persistent lack of digital skills with less than 40% of entrepreneurs receiving training in advanced digital tools. Despite public-private efforts, the demand for skills in cybersecurity, data analytics and software development outstrips available talent, creating a gap that impacts the competitiveness and dynamisation of firms in the digital domain.

Low confidence in digital platforms also slows down the adoption of e-commerce. Fifty-eight per cent of SMEs distrust electronic payment systems due to concerns about security and fraud. The lack of effective dispute resolution mechanisms and limited knowledge of consumer protection regulations in the digital environment exacerbate this problem. In the regulatory sphere, the lack of clear regulations on e-commerce taxation continues to be an obstacle to the expansion of digital platforms. The lack of clarity in e-commerce taxation and complex administrative procedures discourage many companies from formalising their digital operations.

5.4. Digital infrastructure and connectivity

The government has invested in the expansion of digital infrastructure. In the last five years, more than 6.000 km of fibre optics have been built, improving connectivity in urban and peri-urban regions. However, in rural areas, broadband access deficiencies persist, with internet penetration below 40%. Through the Ghana Digital Acceleration Project, it is planned to deploy 4.400 new 4G/5G towers over the next few years to improve the speed and stability of

connections, facilitating access to advanced digital services for businesses and citizens.

The government has made efforts to reduce connection costs. In collaboration with private telecommunications operators, it has managed to reduce internet access costs by 30%, encouraging businesses to adopt digital solutions. Despite this, the price of internet access remains high for small entrepreneurs and SMEs in low-income sectors.

5.5. Opportunities for improvement and recommendations

To accelerate business digitalisation in Ghana, it is critical to address current challenges with concrete strategies that address existing barriers.

In the financial sphere, the creation of public-private investment funds aimed at incentivising technology adoption in SMEs is recommended. The expansion of digital microcredit lines with preferential rates can foster access to finance for technology start-ups. For training to achieve mass digital empowerment, free training programmes should be developed - or existing ones reinforced - in digital skills relevant to SMEs such as digital marketing, e-commerce and data management. In parallel, the launch of an online training portal with digital certifications for entrepreneurs can contribute to improving digital literacy in the workforce.

Regulation should reduce the tax burden for SMEs importing or purchasing advanced digital technologies, in order to incentivise their purchase to contribute to digitisation and digital skills acquisition. The implementation of tax incentives and the creation of a digital quality seal for companies certified in good technological practices are recommended.

Finally, the expansion of digital infrastructure should include the implementation of free connectivity zones in markets and industrial centres so that SMEs can access digital solutions without economic restrictions. The creation of a business digitalisation observatory that monitors the progress of the digital ecosystem and proposes improvements based on evident achievements and persistent challenges is also recommended.

6. Employability in the technology sector

The Information and Communication Technology (ICT) sector in Ghana has experienced sustained growth in recent years, establishing itself as a key driver of economic transformation. According to the Ghana Statistical Service (GSS), ICT activities accounted for approximately 3.6% of GDP in 2021, reflecting its growing impact on the country's economy.

The World Bank's Ghana Rising: Accelerating Economic Transformation and Creating Jobs report highlights that the sector's expansion has been driven by the massive adoption of digital services, telecommunications and software solutions, especially those linked to mobile devices. Business digitalisation has gained prominence, with an increasing number of Ghanaian companies incorporating business management software, CRM and ERP to improve operational efficiency. Internationally, Ghana's relevance in the technology ecosystem has been recognised by global companies such as Google, which established its first artificial intelligence (AI) research lab in Africa in Accra in 2019, making the country a hub for innovation in this area.

However, the development of the ICT sector has not been evenly distributed across the country. The concentration of job opportunities in large cities limits equitable access to digital employment, especially in rural areas. According to the Ghana Digital Economy Policy and Strategy, the main technology companies, innovation hubs and multinational offices are mainly located in Accra, Kumasi and Takoradi, which has led to a digital divide in the distribution of technology talent. These cities concentrate the most in-demand job profiles in the digital economy, such as software developers, digital marketing experts and cybersecurity specialists, while in the rest of the country access to training and opportunities in this sector remains limited.

This context highlights the need to strengthen training and decentralisation initiatives for digital employment to ensure that more Ghanaians can benefit from the boom in the ICT sector and contribute to the development of a more inclusive digital economy.

6.1. Ghana's business fabric

Ghana has developed a dynamic entrepreneurial ecosystem in recent decades, characterised by a predominance of small and medium-sized enterprises (SMEs), an expanding services sector and a growing adoption of digital technologies in business. Despite progress, the country faces challenges such as high informality, business concentration in Accra and the need to diversify sources of investment to stimulate balanced growth across the country.

The total number of business establishments in Ghana is estimated at over 630.000, with a strong predominance of micro-enterprises and SMEs, which account for about 99% of the total. The majority of these businesses operate in the trade, manufacturing and services sectors, with wholesale and retail trade being the most common activity. The growth of the entrepreneurial ecosystem has been driven by factors such as the country's political stability, a young entrepreneurial population and government policies aimed at strengthening the private sector.

Ghana's entrepreneurial dynamism is reflected in the increase in the number of new businesses registered in recent years. However, emerging businesses face significant challenges such as limited access to finance, lack of business training and administrative bureaucracy. In addition, the duality between formal and informal enterprises remains a structural challenge, with approximately 90 % of productive units operating informally, limiting their access to finance and their capacity to expand.

Sectoral and geographical distribution of enterprises

The services sector dominates the country's business structure, accounting for more than 80 % of registered establishments. Within this sector, commerce accounts for more than half of the businesses, followed by activities such as hotels and restaurants, education and personal services. Manufacturing, although growing, still accounts for a smaller share of the total number of enterprises, while formal business agriculture has a marginal presence, as most agricultural production is in the informal sector.

From a geographical perspective, business activity is highly concentrated in the Greater Accra region, which is home to approximately 29% of the country's companies.

It is followed by the Ashanti region, with Kumasi as the main business center after the capital. In contrast, the northern regions of the country have a significantly lower business density, reflecting the need for decentralisation policies to encourage investment in these less developed areas.

Factors driving business growth

The growth of the business fabric in Ghana has been driven by several key factors:

- Entrepreneurial culture: the Ghanaian population has a high rate of entrepreneurial activity, resulting in the constant creation of new businesses, especially in the informal sector.
- Growth of the digital sector: digitalisation has facilitated the proliferation of businesses in e-commerce, fintech and digital services, expanding opportunities for entrepreneurs.
- Foreign direct investment (FDI): Ghana has attracted significant FDI in strategic sectors such as mining, manufacturing and technology, which has stimulated business development.
- Government support programmes: various government initiatives have facilitated access to finance, business training and simplified procedures to encourage entrepreneurship.

Challenges for entrepreneurs

Despite the country's entrepreneurial dynamism, new ventures face multiple barriers that hinder their consolidation:

- Access to finance: many entrepreneurs lack access to formal credit due to high collateral requirements and high interest rates.
- Bureaucracy and formalisation costs: the process of registering and legalising businesses can be cumbersome, which discourages the formalisation of businesses.
- Infrastructure and connectivity: Despite improvements in digital infrastructure, power outages and limited connectivity in rural areas affect the competitiveness of many businesses.
- Training and business skills: Lack of knowledge in financial management, marketing and digitisation limits the long-term success of many SMEs.

6.2. Government programmes to support entrepreneurship

The Ghanaian government has implemented various strategies to incentivise business creation and growth, with a focus on strengthening the private sector and modernizing the entrepreneurial ecosystem. These initiatives include financing funds, training programmes and fiscal policies designed to reduce barriers to entry into entrepreneurship.

State initiatives to foster entrepreneurship

- National Entrepreneurship and Innovation Programme (NEIP): created in 2017, this national programme provides seed funding, training and mentoring to early-stage startups and entrepreneurs. Since its launch, it has supported more than 15.000 companies and contributed to the creation of more than 100.000 jobs.
- YouStart: an initiative launched in 2022 to provide accessible finance to young entrepreneurs. It offers soft loans and grants of up to 50.000 Ghana cedis for emerging startups, with the aim of boosting self-employment and innovation.
- One District, One Factory (1D1F): industrialisation programme that seeks to establish factories in each district of the country through incentives for private investment, promoting manufacturing and value addition in strategic sectors.

Access to finance and credit for entrepreneurs

The government has created various financial support funds to facilitate access to capital:

- Development Bank Ghana (DBG): development bank launched in 2022 to provide long-term financing to SMEs through financial intermediaries.
- Venture Capital Trust Fund (VCTF): government fund that invests in startups and small businesses with high growth potential.
- Microfinance and Small Loans Centre (MASLOC): microcredit programme targeting low-income entrepreneurs and informal small businesses.
- Coronavirus Alleviation Programme (CAP BuSS): an emergency fund that provided soft loans and grants to small businesses affected by the pandemic.

Capacity building and business training

Capacity building is a priority for the government, with multiple training initiatives:

- Ghana Enterprises Agency (GEA): provides training and mentoring to small businesses across the country.
- NEIP Training and Incubation Programme: provides training in business management, financial planning and digital marketing.
- Digital training programmes: joint initiatives with international organisations such as GIZ have enabled thousands of entrepreneurs to be trained in the use of digital tools to improve the competitiveness of their businesses.

Tax and regulatory incentives for SMEs and startups

- Tax exemption for startups: companies founded by young people under 35 in key sectors can access a five-year tax exemption.
- Tax relief for companies in less developed regions: businesses established outside Accra and Kumasi can benefit from reduced tax rates.
- Startup-specific regulation: A Startup Act is being worked on to streamline registration processes and establish a more favourable environment for technology entrepreneurship.

Business support institutions

Ghana has several agencies in charge of promoting entrepreneurship and private sector development:

- Minister of Trade and Industry: designs policies for business growth.
- Ghana Investment Promotion Centre (GIPC): facilitates foreign investment and local business development.
- Minister of Communications and Digitisation: leads programmes to promote business digitisation.
- Ghana Enterprises Agency (GEA): main support agency for SMEs and micro-enterprises.

6.3. Technology and digitally focused job opportunities

The technology sector in Ghana has grown significantly in recent years, consolidating the country as an emerging centre of digital innovation in West Africa. The implementation of policies such as the Ghana Digital Economy Policy and Strategy and the Ghana Digital Acceleration Project has contributed to the growth of employment in the technology sector, encouraging the adoption of digital tools in various productive sectors and promoting the training of ICT talent.

The impact of the digital sector on the economy is reflected in increased job opportunities in areas such as software development, data analytics, cybersecurity, fintech and telecommunications. According to estimates by the Ministry of Communications and Digitisation, the growth of the ICT sector could generate more than 100.000 direct and indirect jobs over the next five years, as digitisation expands in key sectors such as finance, education and agribusiness.

Despite this growth, the distribution of opportunities remains uneven, with a strong concentration in cities such as Accra, Kumasi and Takoradi, where most technology companies, innovation hubs and digital startups operate. The gap between urban and rural areas in terms of access to employment in the tech sector remains a challenge, highlighting the need for strategies to decentralise opportunities and strengthen digital skills across the country.

The booming technology sector in Ghana has driven demand for skilled profiles in various digital areas. Below are the main categories with the highest projected employment:

1. Software engineering

- Job demand: Software engineering is one of the most sought-after disciplines in the country. With the increasing adoption of digital solutions, fintech and e-commerce platforms, companies are looking for software developers, programmers and mobile app specialists.
- Estimated salaries:
 - 1-3 years of experience: 3.000 – 5.500 GHS.
 - 4-7 years of experience: 6.000 – 10.000 GHS.
 - More than 7 years of experience: 12.000 – 20.000 GHS.

2. Data science and big data analytics.

- Job demand: digital transformation in sectors such as banking, telecommunications and healthcare has generated a high demand for experts in data analytics, artificial intelligence and machine learning. However, available talent remains scarce, representing an opportunity for training in this area.
- Estimated salaries:
 - 1-3 years of experience: 4.000 – 6.500 GHS.
 - 4-7 years of experience: GHS 7.000 – 11.000.
 - More than 7 years of experience: 13.000 – 22.000 GHS.

3. Cybersecurity

- Job demand: With the advance of digitalisation, cybersecurity has become a priority for businesses and government entities. The increasing sophistication of cyber-attacks has led to a high demand for cyber security and data protection experts.
- Estimated salaries:
 - 1-3 years of experience: 4.500 – 7.000 GHS.
 - 4-7 years of experience: 8.000 – 12.000 GHS.
 - More than 7 years of experience: GHS 15.000 – 25.000.

4. Fintech and digital banking

The fintech sector in Ghana has experienced explosive growth in recent years, driven by high mobile penetration and increased adoption of digital payments. Ghana leads Africa in terms of mobile money interoperability, which has generated multiple job opportunities in the sector.

- Job opportunities:
 - Fintech solution developers.
 - Blockchain specialists.
 - Digital financial regulation experts.
 - Risk analysts in electronic payment platforms.

5. Technological infrastructure and telecommunications

The deployment of fibre-optic infrastructures, the expansion of 4G networks and the future implementation of the 5G network have boosted employment in the telecommunications sector. Companies such as MTN, Vodafone and AirtelTigo are leading investment in this area.

- Job opportunities:
 - Network and telecommunications engineers.
 - Digital infrastructure installation technicians.
 - System administration and technical support specialists.

Employment in the technology sector in Ghana has a variety of hiring patterns and emerging trends:

- Time to hire: it is estimated that it takes between 3 to 6 months for a professional with a technology background to find employment, depending on their specialisation and experience.
- Type of employment:
 - 65 % of ICT professionals are employed full-time.
 - 20 % work under temporary or project-based contracts.
 - 15% are freelance, providing services to local and international companies.
- Remote working: While most technology jobs are still face-to-face or hybrid, the trend of remote working has increased in recent years, especially in software development and cybersecurity consulting.

Despite the growth of the digital sector, Ghana faces challenges in terms of training and access to skilled talent. To boost job opportunities in the technology sector, the following strategies are recommended:

1. Expand training in digital skills: training in advanced technology skills, such as software development, data analytics and artificial intelligence, needs to be strengthened to improve the employability of the workforce.

2. Incentivise investment in tech start-ups: the creation of funding mechanisms and tax incentives can boost job creation in the digital ecosystem.
3. Strengthen cooperation between the private sector and universities: develop training programmes adapted to the needs of the labour market and encourage dual training between companies and educational centres.
4. Encourage decentralisation of digital employment: promote technology hubs in regions outside Accra and Kumasi to expand employment opportunities throughout the country.
5. Improve regulation of remote work and freelancing: adapt the legal framework to new labour trends to attract global talent and improve conditions for digital workers in Ghana.

Focusing on specific sectors such as banking and fintech, e-commerce, telecommunications and cybersecurity have seen an increase in the need for labour with digital skills, especially advanced digital skills.

Below is a table with the main sectors and an approximate range of professionals required in the period 2024-2026. The data for the table comes from the Central Bank of Ghana's Ghana Industrial Skills Gap Survey and the World Bank's 2019 Digital Skills in Sub-Saharan Africa: Spotlight on Ghana reports:

Table 4 ICT sectors requiring labour in Ghana and approximate number of professionals required for the period 2024-2026c. Sources: Ghana Industrial Skills Gap Survey (2023) and World Bank's Digital Skills in Sub-Saharan Africa: Spotlight on Ghana.

Sectors	Number approximate of professionals required (2024-2026)
Fintech and digital banking (financial services)	15.000 - 20.000
Development of Software and mobile applications	12.000 - 15.000
Telecommunications and networks	8.000 - 10.000
Digital marketing and e-commerce	6.000 - 8.000
Data analytics and artificial Intelligence	5.000 - 7.000

Cybersecurity and data protection	4.000 - 6.000
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According to the table, there is a high demand for professionals specialising in advanced digital skills such as software engineers with expertise in artificial intelligence and cybersecurity, as well as digital marketing and e-commerce professionals. The expansion of online payments and the evolution of mobile banking have fuelled this demand, especially in the fintech sector. The increase in cybersecurity specialists is in response to government initiatives to digitise procedures, through policies such as the use of the Ghana Card for electronic procedures, while the increased use of financial platforms increases the demand for cybersecurity specialists to protect sensitive banking data of both customers and banks.

The fintech and digital banking sector is leading the adoption of e-services to address the consolidation of startups and companies offering payment solutions, online lending, and mobile app-based savings and investment services. In-demand skills include web and mobile programming, cybersecurity, risk management and regulatory compliance (regtech).

The growing number of smartphone users and the need to digitise business processes are driving the search for software developers. In-demand programming languages include Java, Python and JavaScript, along with web and mobile development frameworks. This sector also encompasses data analytics to optimise user experience and business decision-making.

In the field of telecommunications and networks, the implementation of 4G infrastructures and the imminent adoption of 5G require engineers and technicians capable of managing high-capacity networks. Professionals specialised in the expansion of fibre optic networks are also needed to improve coverage in rural areas and bridge the digital divide. The public and private sector are working together to increase national connectivity.

The rise of online sales platforms such as Melcom Online or Tonaton requires profiles of digital marketing and e-commerce specialists with skills in SEO (Search Engine optimisation), SEM (Search Engine Marketing), social media management and digital campaign analysis. In addition, opportunities arise for specialists in e-commerce and smart logistics to optimise the distribution and delivery of products nationwide.

The need to process and analyse large volumes of data has increased the relevance of data analytics and artificial intelligence profiles with skills in machine learning, deep learning and big data tools. Banks, insurance companies, telecommunications companies and government entities are looking for professionals capable of turning data into valuable information for decision-making and service design.

With the expansion of digital services, the risks of cyber-attacks are increasing, requiring cybersecurity and data protection experts. Public bodies such as the Ghana Cybersecurity Agency (CSA) and private companies demand professionals in penetration testing, vulnerability analysis, incident management and legal compliance with data protection laws.

The growing relevance of digital security has stimulated the creation of new positions and the specialisation of existing ones.

Impact of the Ghana Digital Economy Policy and Support Programmes on the creation of technology and digitally-focused job opportunities

The Ghana Digital Economy Policy (2024), issued by the Ministry of Communications and Digitisation, guides public and private sector efforts to strengthen digital education, promote entrepreneurship and accelerate the adoption of emerging technologies (such as AI and blockchain). The policy sets ambitious targets for connectivity, internet penetration and the number of Ghanaians trained in ICT skills by 2030.

It has four training and funding programmes for the acquisition of digital skills.

The National Entrepreneurship and Innovation Programme (NEIP) is a Ghanaian government initiative designed to foster entrepreneurship and innovation among young people. The programme provides seed capital, business advice and mentoring to startups, with the aim of stimulating the creation of innovative solutions and the generation of quality employment. This comprehensive support enables entrepreneurs to overcome financial and operational barriers, facilitating the transformation of ideas into sustainable businesses. By focusing on capacity building and financing, NEIP contributes significantly to the development of the entrepreneurial ecosystem in Ghana, promoting a culture of innovation and economic resilience.

Ghana Investment Fund for Electronic Communications (GIFEC) guarantees digital inclusion in all regions of Ghana, especially in rural and underserved areas. Through financing and training programs, it ensures internet coverage and digital literacy in rural and remote areas to reduce the rural-urban digital divide by facilitating the integration of rural communities into the digital economy, promoting socioeconomic development and digital equity in the country.

Venture Capital Trust Fund (VCTF) seeks to leverage investment in ventures with high growth potential, with a special focus on the technology industry. By providing venture capital, the fund enables companies to scale their operations and demand increasingly specialised profiles. This capital injection not only strengthens the operational capacity of startups, but also stimulates job creation and competitiveness in the technology sector. The VCTF plays a crucial role in energising Ghana's entrepreneurial ecosystem, promoting innovation and sustainable economic growth.

Ghana Cares "Obaatampa" Programme aims to accelerate digitisation projects across the country for the benefit of the Ghanaian people and to drive a digital economy. It focuses on investing in, consolidating, strengthening and expanding the national fibre optic network to improve internet connectivity. It promotes increased digital literacy and supports Ghanaian technology entrepreneurs in building technology hubs and exporting IT-enabled services. By accelerating the implementation of government digital initiatives, the programme aims to ensure digital access for all, ensuring connectivity for people in their daily lives and fostering inclusive economic growth in the digital age.

According to estimates in the World Bank report, Ghana Digital Acceleration Programme (2025), the digitisation of services in the financial sector, agriculture and trade could drive the creation of between 50.000 and 100.000 formal ICT jobs within five years. The formalisation of digital transactions contributes to tax collection and the efficiency of government procedures, creating a more transparent and inclusive environment.

6.4. Profile of today's technology workers

Ghana requires varied technology profiles depending on the training and experience of ICT graduates - both university and vocational -, the expansion of the ICT sector and the wide participation of young people with university or technical training. According to studies by the Ministry of Communication and Digitisation (MoCD), 60% of those working in the digital sector have higher education degrees in computer engineering and information systems, while 40% come from disciplines such as business administration or mathematics, complementing their skills with additional ICT training.

The following table shows typical technology profiles in Ghana according to their category, level of education, hiring characteristics and key digital skills.

Table 5 Technology profiles in Ghana, training and hiring characteristics. Sources: GSS, World Bank and MoCD, GEA.

Category	Typical education and experience	Characteristics and recruitment	key digital skills
Young graduates entering employment after completing their studies	<p>Mostly between 18 and 35 years old.</p> <ul style="list-style-type: none"> - University or technical degree in ICT, computer science, information systems, business administration or mathematics. - Initial experience (0 to 2 years) in software development, technical support, or digital services (internships). 	<p>Placement High rate of employment in technology SMEs and large local companies.</p> <ul style="list-style-type: none"> - Junior contracts with internal training plans. - Scholarships and programmes to promote youth employment (Generation Ghana). 	<ul style="list-style-type: none"> - Basic to intermediate programming (Java, Python, JavaScript). - Basic data analytics and cloud environment management. - Familiarity with agile methodologies (Scrum).
Professionals in digital reconversion	<p>Graduates in business administration, mathematics or non-STEM fields, with additional training of 3-12 months in ICT skills.</p> <p>3-8 years' previous experience in banking, manufacturing, insurance or logistics.</p>	<p>Temporary or permanent contracts.</p> <ul style="list-style-type: none"> - Integration into upskilling/reskilling programmes promoted by the government and the private sector. - High demand in large companies and technology SMEs. 	<p>Intermediate knowledge of programming languages.</p> <ul style="list-style-type: none"> - Use of cybersecurity, big data, and project management. <p>Adaptability to rapidly evolving digital environments.</p>
Freelancers and remote workers	<p>Young people and adults with 2-5 years (or more) of experience in web development,</p>	<p>Project-based work (freelance). Outsourced services for international clients, use of freelance platforms.</p>	<p>Advanced programming, digital marketing (SEO, SEM), design of cloud platforms.</p>

	<p>UX/UI design, data analytics, digital marketing, etc. Variable education: from university degree to specialised online certifications.</p>	<p>- Growing adoption of remote work in software, marketing, and IT consulting.</p>	<p>Video conferencing skills, virtual coordination, self-organisation.</p>
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Ghanaian digital talent is found to be young (18-35 years old) and mostly with a university or technical background related to computer engineering, information systems and mathematics. Recruitment is concentrated in technology SMEs and large local companies, where starting salaries compete favorably with other sectors. The growing importance of those coming from other disciplines (e.g. business administration or logistics) and acquiring ICT skills through intensive 3-12 month courses is striking, a type of training that is being promoted by both government and private institutions.

The rise of freelance and remote work indicates that Ghanaian companies, as well as international clients, value flexibility and skills in programming, digital marketing, data analytics and agile methodologies. This phenomenon has enabled many young people and professionals with 2-5 years' experience to offer their services on a global scale, benefiting from remote employment platforms. However, it is cautioned that the lack of international certifications (e.g. CompTIA, Cisco, AWS) and the disparity in the quality of internet connectivity in some regions may restrict growth opportunities for part of the ICT workforce.

In terms of salary levels and working conditions, the following table, based on the reports cited above, provides a comparison of salaries in the ICT sector in relation to manufacturing, finance, retail and agribusiness, indicating whether it is lower or higher than the ICT sector and the level of experience required by each sector:

Table c Comparison of ICT sector wage levels and working conditions with other economic sectors: Sources, GSS, World Bank, GEA, MoCD, Ghana Ministry of Agriculture

Sector	Position/Experience	Estimated salary range (In Ghanaian Cedi GHS)	Comparison with ICT
Technologist (ICT)	Junior (0-2 years) Medium (3-5 years) Senior (+5 years)	1.800 - 3.500 GHS 3.600 - 6.500 GHS +7,000 GHS	Competitive salaries with high progression. Bonuses for certifications.
Manufacturing	Operator Specialised Supervisor	900 - 1.800 GHS 2.000 – 3.500 GHS	Below the ICT in middle and senior management positions. Moderate gap in operational positions.
Finance and banking	Junior Analyst Account Manager	1,500 - 2,800 GHS 3.000 – 5.000 GHS	Competitive; in ICT-related positions and can match or exceed ICT. may
Retail	Salesperson/Assistant Store manager	700 – 1.500 GHS 1.600 – 2.500 GHS	Much lower than ICT and fewer digital skills required.
Agroindustry	Technician Agro-industrial Supervisor	800 - 1,600 GHS 1.700 – 2.800 GHS	Lower than ICT, although digitisation is increasing demand for roles in data and automation.

We can see that ICT salaries are competitive, especially at the middle and senior levels, where they can clearly outperform most other manufacturing sectors. In finance and banking, salaries can be on a par in positions requiring digital skills, for example, in data analysis and financial management software implementation departments.

On the other hand, retail and agribusiness have significantly lower salaries, reflecting the lower need for specialised digital skills. Still, these sectors are starting to digitise (particularly in agribusiness, with automation solutions and the use of big data for the supply chain), which, in the medium to long term, could raise salaries in certain positions. This development underlines the importance of training programmes and lifelong learning to enable workers in other fields to retrain and access higher-wage technology profiles.

The lack of digital opportunities has resulted in many Ghanaian skilled workers migrating abroad in search of digital opportunities. Most of the professionals recruited in the countries listed in the table below are on average between 25 and 40 years old, with advanced digital skills in programming and data analytics.

The following table lists the top countries hiring Ghanaian digital talent in 2024, indicating the estimated number of professionals hired, the sectors where they are hiring the most and the indicative sources of the number of people hired:

Table 7 Top countries hiring Ghanaian digital talent in 2024. Source. Ghana Embassy in the US, Ghana High Commission in the UK, Immigration Canada, MoCD Ghana, Ghana-UAE Chamber of Commerce and global talent agencies.

Country	Estimated number of migrants employed in the ICT sector	Most common areas of recruitment in the ICT sector
United States	3.500-4.000	Software development, data science, cybersecurity
United Kingdom	2.000-2.500	Web development, remote systems engineering, digital marketing.
Canada	1.200	Big Data, QA testing, software architecture, cloud development
Germany	700-900	IA, programming, fintech
United Arab Emirates	500-700	Mobile development, e-commerce, cloud development

The United States, the United Kingdom and Canada stand out as the main destinations for programming, data science, cybersecurity and software architecture professionals, with an estimated 3.500 to 4.000 Ghanaians employed in the US. This phenomenon of skilled emigration or "brain drain" reflects the international competitiveness that Ghanaian ICT-trained professionals are acquiring, but at the same time poses challenges for the local market, which must struggle to retain and attract highly specialised talent.

Sectors such as fintech, artificial intelligence and cloud computing developments are particularly attractive to young and experienced workers, who are finding advanced training and salary opportunities in countries in Europe, North America and the Middle East. However, initiatives by the Ghanaian government and various international organisations (e.g. World Bank Group, GIZ and AfCFTA) could help to create a more competitive domestic labour environment, where improved digital infrastructures, the promotion of innovation hubs and increased scholarships for international certifications will encourage these professionals to maintain and develop their careers in Ghana.

6.5. Employment prospects and sector growth

ICT Employment Growth Projections (2025-2030)

According to the World Bank's Ghana Rising: Accelerating Economic Transformation and Creating Jobs report (2022), employment in the ICT sector in Ghana is estimated to grow by around 8% annually over the next decade, driven by factors such as the rapid expansion of digital connectivity and the increasing demand for technology solutions in areas such as precision agriculture, digital financial services and Industry 4.0. Below is a table with an example of a hypothetical projection of the evolution of the number of jobs in the ICT sector from 2025 to 2030, starting from an estimated base of 70.000 jobs in 2024:

Table 8 Hypothetical projection of ICT jobs in Ghana for the period 2025-2030: Source: Ghana Rising: Accelerating Economic Transformation and Creating Jobs by the World Bank (2022)

Year	Estimated Jobs
2024	70.000
2025	72.000
2026	77.800
2027	84.000
2028	90.700
2029	97.900
2030	105.700

These data represent a theoretical scenario based on the average growth of 8% per annum cited by the above sources. The ICT sector is expected to be one of the main generators of skilled employment in Ghana, given the continued digitization of the economy. Programmes such as the Ghana Digital Agenda and the Transformation of Essential Public Services (e-Government), both supported by agencies such as the Ghana Ministry of Communications and Digitisation (2021) and the African Union Digital Transformation Strategy (2020-2030) will strengthen job creation in the ICT sector by requiring labour to contribute to the digitisation of the public administration.

Relationship between sector growth and digitisation of the Ghanaian economy

The close link between ICT employment growth and the digitisation of the economy manifests itself on several fronts. On the one hand, the adoption of cloud solutions, the use of e-commerce platforms and the proliferation of mobile payment services are fuelling the creation of new jobs, not only for ICT specialists, but also for hybrid profiles related to user experience, software development and data management. On the other hand, the growing entrepreneurial culture in Ghana - reinforced by technology incubators and accelerators such as MEST Africa and Ghana Tech Lab - has led to the emergence of local startups focused on financial technology, outsourcing services and automation, as analysed in the previous section, boosting the global competitiveness of SMEs in the Ghanaian ICT sector and contributing to the formalisation of its business fabric, preventing ICT graduates who want to work in the sector from being pushed into the informal economy.

Comparing the growth of the Ghanaian ICT sector with its Mauritanian, Ivorian and Senegalese counterparts

In order to get an idea of the state of growth of the ICT sector in Ghana and its employment and growth prospects, it is advisable to compare it with the situation in the three countries participating in the project: Côte d'Ivoire, Senegal and Mauritania.

Côte d'Ivoire has made significant progress in expanding broadband coverage, with government policies offering tax incentives to technology SMEs. The implementation of tech hubs in Abidjan has favoured the creation of jobs in programming and data analysis. One of the successful strategies is the promotion of foreign direct investment in collaboration with telecommunications companies, which has facilitated access to financing and technical training. In Senegal, the "Digital Senegal 2025" initiative prioritises infrastructure development and digital inclusion in rural areas. Public-private partnerships have been promoted for digital literacy and the expansion of e-Government services. As a result, the Senegalese ICT sector has grown at rates comparable to those of Ghana, and employment has been boosted both in local start-ups and in subsidiaries of multinational technology companies. Mauritania, although it has a less developed digitalisation base, aims to modernise public administration by adopting online platforms and improving connectivity. While its growth in ICT employment is more modest than in Ghana, regional agreements have been put in place to reduce data roaming costs and encourage the mobility of skilled professionals, taking advantage of the synergy of the Arab Maghreb Union and ECOWAS.

Successful experiences in Côte d'Ivoire and Senegal illustrate how the consolidation of public-private partnerships can efficiently mobilise resources to build quality ICT infrastructure. In Côte d'Ivoire, the cooperation of large private teleoperators with the government allowed the installation of fibre optic networks and data centres in areas with low coverage, boosting the use of e-commerce platforms and digital services. In Senegal, agreements between the authorities and foreign investment funds have facilitated the construction of training centres and innovation laboratories, where young entrepreneurs and technology start-ups receive mentoring and access to specialised equipment. In parallel, the introduction of tax incentives, together with intensive talent training, have been instrumental in the inclusion of tech SMEs and vulnerable groups. In Mauritania, temporary tax exemptions for companies investing in rural areas with low digital penetration fostered the emergence of new software initiatives and financial solutions.

At the same time, training programmes targeting the female population in areas such as programming, data analytics and digital marketing were boosted, substantially increasing women's participation in the technology ecosystem and contributing to narrowing the gender gap.

Regulatory barriers and access to funding sources.

The tech sector in Ghana faces regulatory and financial challenges that can slow its expansion.

Data protection and e-business regulations still require frequent updates to keep pace with innovation, creating uncertainty for SMEs and startups due to the bureaucracy associated with licensing and registration procedures. In contrast, Senegal has managed to simplify its software and digital business registration procedures, offering a model for Ghana to follow in this field.

Limited access to capital remains a challenge. Many startups lack the collateral and contacts needed to qualify for conventional credit. Although investment funds and accelerators exist, the volume of seed capital is still insufficient. In addition, there is a lack of specific tax incentives, such as temporary exemptions or deductions for R&D investment, which are common in other countries in the sub-region. Côte d'Ivoire has promoted one-off subsidies for the acquisition of ICT equipment, encouraging the creation of local innovative solutions, a strategy that Ghana could adopt to strengthen the competitiveness of its technology SMEs.

6.6. Analysis of women in innovation and digitisation

Women's participation in Ghana's technology sector has increased over the last decade, although the gender gap persists. According to the official Ghana News Agency (GNA) in 2024, 17.57% of technology professionals in Ghana are women, working in sectors such as manufacturing, mining and public services, while the presence in occupations requiring advanced digital skills such as cybersecurity remains low. However, barriers to women's full inclusion in the ICT sector in Ghana remain, but there are academies and entrepreneurs who are providing opportunities for women's inclusion in the sector.

Women in Ghana face a number of structural barriers that limit their full participation in the technology sector. Among the most prominent

is unequal access to higher education, especially in STEM careers, where male students tend to be prioritised. According to data from the Mastercard Foundation, the GIZ and the International Consortium for Agricultural Research Consultation, the lack of sufficient scholarships or support and cultural stereotypes about who should study science and engineering have a negative impact on young women's opportunities. In addition, the persistence of entrenched gender roles - which impose domestic and care responsibilities - limits the time available for training, especially in areas that require internships and continuous training.

Another important structural challenge is the difficulty in accessing sources of funding. Many women with technology entrepreneurship ideas encounter obstacles when applying for loans or seeking investors, partly due to a smaller network of contacts and lack of collateral. Also, the work culture in some Ghanaian companies, which have historically been male-dominated, may discourage women from staying if clear policies on work-life balance, pay equity and mentoring are not in place. The low presence of female leaders in management positions and the low proportion of women in sectors such as cybersecurity reinforce the gender gap, as noted by the official Ghana News Agency (GNA), which puts female participation in the technology field at 17,57% of professionals (2024).

As indicated in the following table, this percentage, although low, is higher than in Senegal, Mauritania and Côte d'Ivoire, the three countries participating in the programme and where the persistence of gender roles and the difficulty of accessing sources of funding hinder the presence of women in the ICT sector:

Table 5 Estimated percentage of women in ICT in Ghana, Senegal, Côte d'Ivoire and Mauritania in 2024 and reasons for limited female presence. Sources: Ghana News Agency, GIZ, Mastercard Foundation, African Union and African Development Bank.

Country	Estimated Percentage of women in ICT (%)	Reasons for the limited presence of women
Ghana	17,6 %	Difficulty accessing financing and limited presence in STEM careers.
Senegal	15 %	Persistent gaps in digital literacy.
Côte d'Ivoire	14 %	Lack of training infrastructure and large-scale mentoring networks

Mauritania	12 %	Cultural constraints and limited offer of ICT training.
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In Ghana, several organisations are actively working to increase women's participation in the technology and innovation fields. Women in Tech Africa has positioned itself as an extensive network that facilitates the connection of women professionals, entrepreneurs and leaders through forums, outreach events and mentoring in digital skills. GirlCode Ghana organises workshops and conferences in schools and universities, showcasing leadership role models and encouraging girls and young women to enter STEM careers. Women in Cybersecurity (WiCyS) West Africa promotes knowledge sharing and specialised training in cybersecurity, an area where women are still in the minority.

Two women stand out as recognised figures in leadership positions in the ICT sector: Regina Honu and Olayinka Naa Dzama Wilson-Kofi.

Regina Honu is the founder of Soronko Academy, an academy that pioneered the introduction of robotics, programming and entrepreneurship training programmes for young women in Ghana. Her work has inspired other leaders in the region to create similar academies and platforms. Olayinka Naa Dzama Wilson-Kofi, representative of WiCyS West Africa, leads initiatives to raise awareness of the importance of cybersecurity and the inclusion of women in this technological field.

International organisations such as the Mastercard Foundation promote specific gender equality policies, thus contributing to increasing the presence of women in managerial and strategic roles within the digital innovation ecosystem.

Women in Tech Africa has established itself as one of the most prominent pan-African networks for the promotion and empowerment of women in the technology sector. Founded by African women ICT experts, its main objective is to bridge the gender gap through training and continuous professional development. To this end, it organises virtual and hybrid conferences with international speakers, mentoring workshops with high-profile female executives and networking spaces where women entrepreneurs, programmers and leaders of technology projects connect. These activities allow participants to obtain direct advice from specialists, explore investment opportunities and gain visibility on a continental scale.

Its presence has expanded to several African countries, also working with educational institutions and cooperation agencies to design programs tailored to young people and women from vulnerable backgrounds. In addition to transferring

digital skills, Women in Tech Africa promotes financial inclusion through training in e-commerce and online marketing tools. Its institutional strategy is based on partnerships with local governments and international donors, which facilitates the long-term sustainability of its initiatives and reinforces the narrative that gender diversity in technology companies can boost innovation and competitiveness in African economies.

GirlCode Ghana began its activities with the mission to spark the interest of girls and adolescents in STEM careers while equipping women seeking to pursue careers in software and digital innovation with practical skills. Its projects range from summer camps and high school coding clubs to intensive coding workshops geared towards young college girls. Each session is designed to be inclusive, so that participants with different levels of prior knowledge feel supported and motivated to keep moving forward.

It has expanded its reach through collaborations with universities and established technology companies, organising hackathons in which mixed teams compete to develop software solutions to local problems. In addition to teaching technical skills, the organisation offers a holistic approach that encompasses leadership and entrepreneurship training. In this way, it fosters participants' self-confidence to launch their own projects or successfully enter the private sector, thus contributing to the diversification and strengthening of the ICT ecosystem in the country.

Women in Cybersecurity (WiCyS) West Africa emerged as a regional chapter of the international organisation WiCyS, which focuses on increasing the visibility and participation of women in the field of cybersecurity. Its promoters in West Africa saw the need to create a specific training and collaborative space for a discipline where the presence of women is particularly low.

Through conferences, webinars and local meetings, WiCyS West Africa showcases career opportunities in systems auditing, digital forensics and vulnerability testing, among other strategic areas. One of its cornerstones is the creation of mentoring networks: cybersecurity experts from multinational companies and government environments guide young students and junior professionals in acquiring technical certifications and developing career paths. To counter the shortage of female mentors, the organisation disseminates case studies of women leaders in cyber intelligence and digital risk management, as well as promoting the adoption of more inclusive corporate and state policies, in order to accelerate the recruitment of female talent in high-skilled positions.

In the realm of relevant female personalities in the Ghanaian ICT ecosystem, Regina Honu is recognised within and outside Ghana for her work to boost the presence of women in the ICT sector. She started her career as a software engineer in an environment where she had little overlap with other female professionals, which led her to reflect on the cultural and educational barriers that hindered more women from participating in the sector. Based on data showing the gender gap in science careers, she decided to found initiatives focused on providing comprehensive training in programming, robotics and creative thinking to girls and teenagers from under-resourced communities.

Honu's vision goes beyond mere technical training: she seeks to instill an entrepreneurial and leadership mindset in the participants. She has been a speaker at international forums such as TEDx and UN conferences, where she gives successful examples of young Ghanaian graduates who, thanks to the training they have received, have created start-ups or have taken positions in renowned technology companies. National and international recognition and donor support have empowered Regina Honu's work, making her one of the most influential voices on gender equality in Africa's innovation ecosystem. Regina Honu is the founder of Soronko Academy, the first coding and robotics training center specifically for women in Ghana.

With locations in urban and peri-urban areas, the academy incorporates a programme that integrates knowledge of web development, digital entrepreneurship and soft skills such as communication and problem solving. In addition to preparing students for software-related jobs, Soronko Academy provides incubation and acceleration spaces where they can refine business plans and receive mentoring from specialists. The academy's model is based on social inclusion: it offers full or partial scholarships to young people with financial constraints and, in turn, collaborates with international organisations such as the Mastercard Foundation and local volunteer programmes to secure funding for its initiatives. The impact of Soronko Academy is evidenced by the growing number of female graduates who access professional internships in technology companies in the region or who undertake their own projects, contributing to the diversification and empowerment of women within the Ghanaian ICT sector.

Another key figure, especially in the field of cybersecurity in Ghana and West Africa, is Olayinka Naa Dzama Wilson-Kofi, President of WiCyS West Africa. With a professional background at the intersection of technology and cyber risk management, Wilson-Kofi leads awareness and training efforts that seek to increase the number of female specialists in areas such as data protection, cyber

threat detection, and government cyber defense. Her work has been referenced in regional forums on digital security, where she provides analysis of real cases and proposals for more inclusive gender policies. One of the main thrusts of her work is the collaboration with universities and technical programmes to introduce cybersecurity modules adapted to the reality of Ghana and other neighbouring countries. Through partnerships with companies and government agencies, Wilson-Kofi promotes the creation of scholarships and the recruitment of young female graduates. It is also involved in the development of corporate guidelines aimed at promoting equal opportunity in recruitment and career advancement, laying the groundwork for more women to excel in a field that is increasingly critical to Africa's digital economy.

The Mastercard Foundation is among the leading funders and partners driving the inclusion of women and youth in the digital economy. Through programmes such as the Inclusive Digital Commerce Initiative (IDC) in Ghana, the foundation channels financial and technical resources to women-led micro and small businesses, with an emphasis on traditionally underserved sectors. The foundation's own reports and communications highlight the provision of training in e-commerce, digital payment platforms and business scaling strategies, together with local partners such as BFA Global and MEST. Its vision is based on building economic resilience and empowerment of vulnerable groups, providing not only funding but also networking and expert support. This comprehensive strategy aims to equip women entrepreneurs and graduates of technology training centers with skills and tools that enable them to compete on a level playing field. In addition, the foundation promotes the constant evaluation of results, requiring its local partners to adopt gender equity and inclusion metrics, which generates a more sustainable and measurable impact on women's empowerment within the digital innovation ecosystem.

7. Strategies and recommendations

The development of the digital and technology ecosystem in Ghana requires structured strategies to address challenges in digital skills, employability and digitisation of businesses. This section presents a comprehensive plan with concrete measures to strengthen the training of digital talent, improve the competitiveness of SMEs and foster technological innovation in the country.

7.1. Strategic plan for digital skills and employability

One of the main challenges of the technology sector in Ghana is the gap between academic training and the needs of the labour market. According to the Ghana Digital Economy Policy and Strategy, less than 35% of technology graduates find employment in the digital sector within six months of completing their studies, due to a lack of alignment between training and the demands of the private sector.

The Ghana Digital Acceleration Project sets digitalisation and ICT training as strategic priorities for the country's development. To ensure the success of these policies, a structured approach based on four key pillars is needed:

1. Creation of a National Digital Skills Framework (NDQF).

Currently, digital skills training in Ghana is fragmented and there is no unified framework that defines the skills needed to access technology jobs. The lack of a standard hinders employability and limits the development of digital talent.

Proposed actions:

- Development of the NQF in collaboration with the private sector, universities and government agencies.
- Integration of the NQF into vocational and higher education curricula.
- Regular evaluations of the NQF to adjust it to the evolving labour market and digital transformation.

2. Strengthening technical education and vocational ICT training

Access to technical training in technology remains limited, especially in rural areas. To improve the employability of youth and adults in the digital sector, the government has implemented programmes such as Ghana Jobs and Skills Project, but these need to be expanded to cover more sectors and beneficiaries.

Proposed actions:

- Expansion of technical ICT training in universities and vocational training centers.
- Creation of digital skills certification programmes tailored to the needs of the sector.
- Specific training programmes for women and rural communities, reducing the digital divide.

3. Public-private partnerships for training and employability

Technology companies in Ghana have expressed the need to strengthen collaboration with the education sector to improve the preparation of graduates.

Proposed actions:

- Creation of sectoral consortia between companies, universities and public bodies.
- Implementation of dual training programmes that combine classroom learning with work experience in technology companies.
- Tax incentives for companies that invest in ICT training for their employees and young people.

4. Expanding access to funding for digital training.

The high costs of technology training and the cost of internet access make it difficult to access quality programmes. Initiatives such as YouStart have provided funding to young entrepreneurs, but more scale is needed to meet the growing demand for ICT training.

Proposed actions:

- Creation of scholarship funds for digital training.
- Micro-credit programmes for ICT training.

3. SME Competitiveness Support Programme.

- Start: 2023 - Ongoing.
- Objective: to improve the competitiveness of Ghanaian SMEs through digitalisation and the adoption of new technologies.
- Responsible entity: Ghana Enterprises Agency (GEA).
- Key measures:
 - Free digital diagnostics for SMEs.
 - Subsidies and credit lines with preferential rates for the adoption of business software.
 - Establishment of a digital advisory center for SMEs.
- Expected results: Incorporation of at least 50,000 SMEs in digital ecosystems by 2026.

Despite progress in digitisation policies, there are barriers to the full digital transformation of SMEs in Ghana:

1. Limited access to finance:
 - Only 30 % of SMEs have access to bank loans for technology investment.
 - Alternative financing mechanisms such as venture capital and public-private investment funds are required.
2. Lack of digital skills:
 - Less than 40 % of SME owners have training in digital commerce and advanced technology tools.
3. Low e-commerce adoption:
 - Only 18 % of SMEs use e-commerce platforms.

Proposed strategies:

1. Expanding access to digital finance:
 - Creation of public-private investment funds for technology adoption in SMEs.
 - Expansion of microcredit lines with reduced rates for companies that digitize their operations.

2. Expansion of ICT training for SMEs:

- Development of training programmes in digital marketing, e-commerce and data management.

3. Incentives for the adoption of digital platforms:

- Tax reduction for SMEs that adopt digital solutions in their business processes.

7.3. Recommendations for improving the digital ecosystem

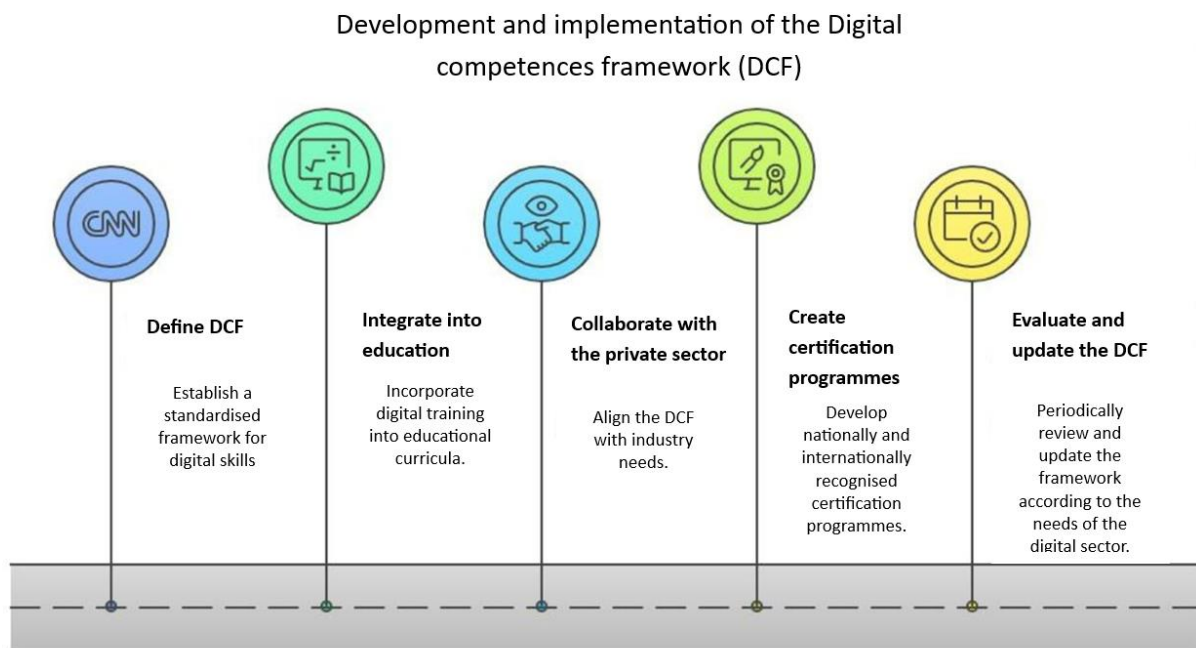
Strengthening the digital ecosystem in Ghana is critical to ensure inclusive and sustainable economic transformation. This requires the implementation of strategies that boost the training of digital talent, encourage the digitisation of businesses, reduce access gaps and promote technological innovation. Below are five key strategies to consolidate Ghana as a benchmark in the African digital economy.

1. Creation of a National Digital Competency Framework (NDFCF).

One of the main obstacles to the growth of the digital sector in Ghana is the lack of a structured digital skills framework to standardise the knowledge and skills needed to participate in the digital economy. Currently, ICT training is fragmented and does not respond to the specific demands of the labour market, limiting the employability of graduates in technology careers.

The following illustration proposes a roadmap for the development and implementation of the NQF, indicating the functions and policies that the NQF will have.

Illustration 12 Development and Implementation of the Digital Competences Framework (DCF).



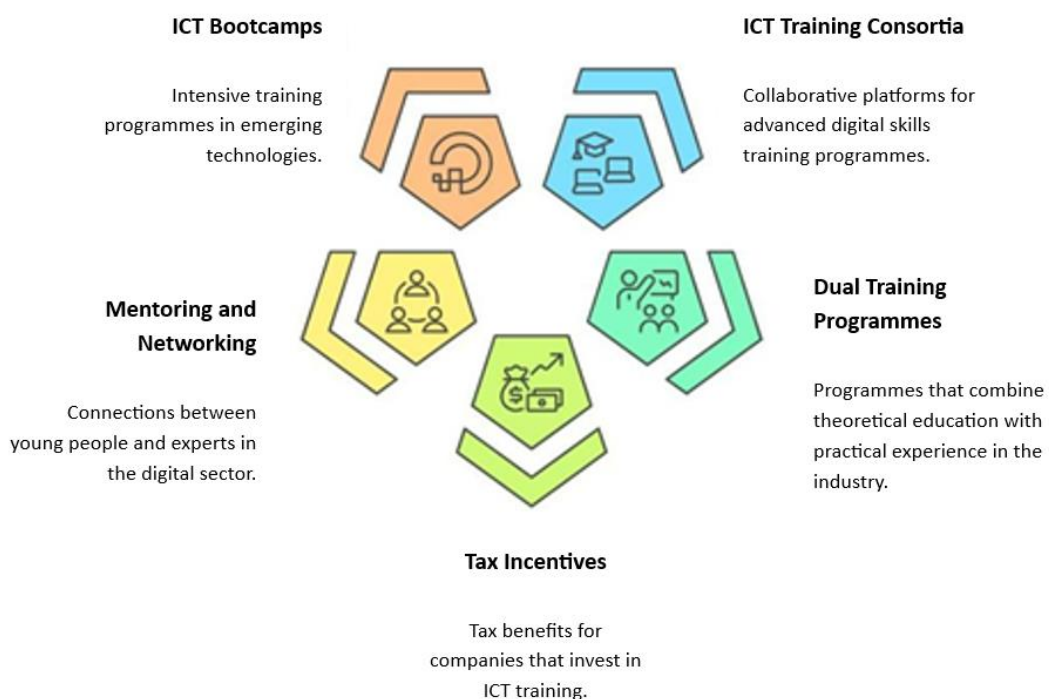
- Define a National Digital Skills Framework (NDQF): develop a standardized framework that establishes the levels of digital skills needed for different sectors and job profiles.
- Integration of the NDCF in formal education and vocational training: incorporate digital training modules in secondary, technical and university education.
- Collaboration with the private sector: align the MNCD with the needs of business and the technology industry to ensure that training is adapted to market trends.
- Certification of digital skills: create nationally and internationally recognized certification programmes that improve the employability of ICT professionals.
- Regular evaluation and updating of the NQF: ensure that the framework evolves with global trends and the needs of the digital sector in Ghana.

2. Strengthening public-private partnerships for training and employability.

The growth of the digital sector requires close collaboration between government, technology companies and educational institutions to ensure that training programmes are aligned with labour market realities.

The following illustration provides proposed actions to leverage public-private partnerships to ensure that ICT training programmes and educational offerings are aligned with the needs of the Ghanaian labour market:

Illustration 13 Comprehensive Drive for ICT Training and Employability.



- Establishment of ICT training consortia: creation of collaborative platforms between companies, universities and technical training centers to design training programmes in advanced digital skills.
- Implementation of dual training programmes: promote programmes that combine theoretical education with practical experience in technology companies, facilitating students' labour market insertion.

- Tax incentives for digital training: establish tax benefits for companies that invest in ICT education and training for their staff.
- Expansion of mentoring and networking programmes: encourage the connection between young professionals and experts in the digital sector through incubators, accelerators and mentoring programmes.
- Promote bootcamps and intensive ICT training: expand access to accelerated training programmes in software development, data analytics, cybersecurity and emerging technologies.

3. Boosting the digitisation of SMEs as a driver of economic transformation.

Small and medium-sized enterprises (SMEs) account for 85% of the business fabric in Ghana, but many still operate with low levels of digitisation, which limits their growth and competitiveness. Lack of access to finance, training and technological tools remains a key barrier.

The illustration below provides some actions to boost the digitisation of SMEs with the aim of being the engine of their economic transformation:

Illustration 14 Boosting the digitisation of SMEs.



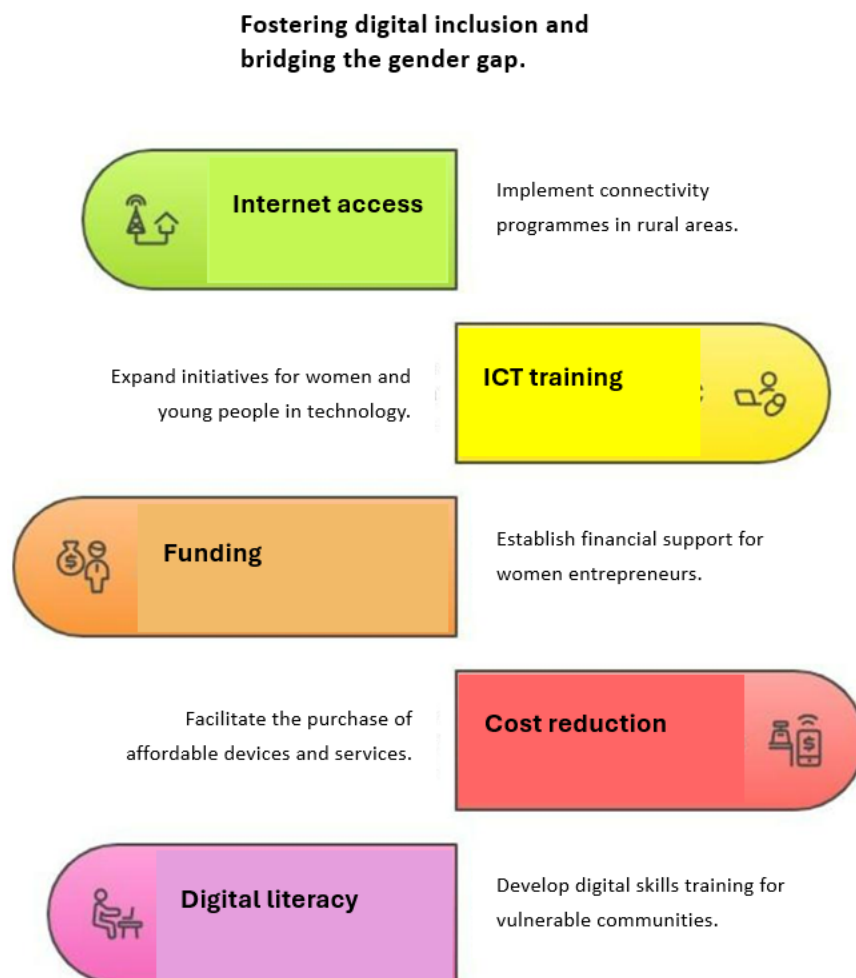
- Creation of an SME Digitalisation Fund: establish a public-private fund to facilitate the adoption of digital technologies in micro-enterprises and SMEs.
- Subsidies and credit lines for digital transformation: provide financial incentives for SMEs to invest in business management software, e-commerce platforms and fintech solutions.
- Digital marketing and e-commerce training: develop training programmes for businesses to take advantage of digital commerce opportunities.
- Expanding access to e-commerce platforms: support the creation of digital marketplaces that enable SMEs to sell their products and services online.
- Developing accessible digital tools: facilitate access to affordable digital software and services for small businesses, including digital payment solutions and process automation.

4. Promoting digital inclusion and bridging the gender gap in the technology sector.

Digital transformation must be inclusive and ensure that all citizens have access to opportunities in the digital economy, regardless of their geographic location, gender or socio-economic status.

The following figure sets out recommendations to foster digital inclusion and reduce the gender gap in the technology sector:

Illustration 15 Recommendations for Fostering digital inclusion and bridging the gender gap.



- Expansion of Internet access in rural areas: implement connectivity programmes to reduce the digital divide between urban and rural areas.
- ICT training programmes for women and youth: expand initiatives such as Girls-in-ICT to encourage female participation in technology careers.
- Creation of funding funds for women-led technology ventures: Establish financial support and mentoring programmes for women entrepreneurs in the digital sector.
- Reducing the cost of access to technology: implement policies that facilitate the purchase of digital devices and access to affordable internet services.
- Promoting digital literacy in vulnerable communities: develop training programmes in basic and advanced digital skills aimed at populations at risk of exclusion.

5. Developing an ecosystem of innovation and technological entrepreneurship.

Ghana has emerged as a hub of digital entrepreneurship in West Africa, with a growing startup ecosystem. However, lack of access to finance and limited support infrastructure remains challenges to the expansion of tech startups.

Recommendations for developing the innovation and tech entrepreneurship ecosystem are set out below:

Illustration 16 Proposals for developing an innovation and technology entrepreneurship ecosystem.



- Creation of a National Technological Innovation Fund: establish a public-private investment fund to support start-ups and emerging technology companies.
- Expansion of start-up incubators and accelerators: encourage the creation of innovation and coworking spaces that facilitate access to mentoring, financing and collaboration networks.
- Attraction of foreign investment in the technology sector: promote policies that encourage the arrival of venture capital and financing for growing technology companies.
- Promoting intellectual property and technological innovation: create support programmes for patent registration and intellectual property protection in the digital sector.
- Development of digital economic zones: implement technology hubs in different regions of the country to decentralise innovation and facilitate access to technological infrastructure.

7.4. Public-private partnership principles between Ghana and the Canary Islands.

The implementation of strategies to strengthen the digital ecosystem in Ghana opens a strategic opportunity to foster knowledge transfer and collaboration between Ghana and public and private actors in the Canary Islands. The experience of the Canary Islands in digitisation, technological innovation and support for the internationalisation of companies can serve as a model to boost the development of the Ghanaian digital economy.

Through training programmes, joint innovation projects, strengthening of the entrepreneurial ecosystem, digitalisation of trade and institutional cooperation mechanisms, both regions can mutually benefit, consolidating Ghana as a benchmark in the African digital economy and the Canary Islands as a strategic partner in the development of technological solutions in West Africa.

The collaboration framework should be based on principles of reciprocity, sustainability and social impact. Reciprocity will ensure that both regions benefit mutually from the exchange of knowledge, talent and investment opportunities. Ghana will be able to benefit from the Canary Islands' experience in innovation and digital entrepreneurship, while Canary Islands institutions and companies will be able to consolidate their presence in the African market. Sustainability

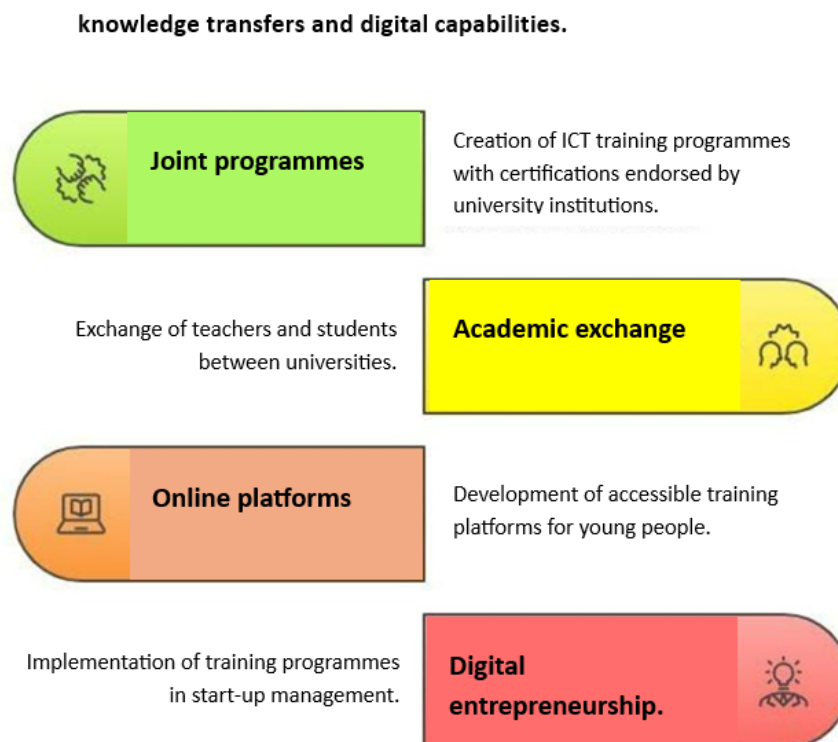
will ensure that joint projects are not isolated initiatives, but are integrated into long-term development strategies, allowing for the continuity and scalability of cooperation programmes. Finally, social impact should be a cross-cutting issue, ensuring that the benefits of collaboration reach broad sectors of the population, especially youth, women and rural communities, promoting equity and digital inclusion.

1. Knowledge transfer and digital skills

Universities and vocational training centres in the Canary Islands can play a key role in the design and implementation of digital skills programmes in Ghana. Institutions such as the University of La Laguna (ULL) and the University of Las Palmas de Gran Canaria (ULPGC) have a strong track record in international cooperation and can contribute their expertise in areas such as artificial intelligence, cybersecurity, data analytics and digital business transformation.

The following image offers a series of proposals to foster the transfer of knowledge and digital capabilities by the ULL and the ULPGC and their Ghanaian counterparts their Ghanaian counterparts:

Illustration 17 Proposals for knowledge transfers and digital capabilities.



- Creation of shared technology hubs and innovation centers, where Ghanaian and Canary Islands entrepreneurs can collaborate in the development of digital solutions.
- Development of pilot projects in digital transformation of strategic sectors, such as agriculture, health and education.
- Establishment of alliances between Canary Islands and Ghanaian startups for the development of technological solutions adapted to local challenges.
- Implementation of research and development (R&D) programmes in applied technology, with funding from multilateral organisations and investment funds.

3. Strengthening the entrepreneurial and business ecosystem.

The entrepreneurial fabric of the Canary Islands, characterised by a network of dynamic SMEs and technology start-ups, can serve as an inspiration for the development of similar initiatives in Ghana. The creation of business networks between the two territories, mentoring programmes and access to joint funding can contribute to the growth of new businesses in the digital sector.

The following are the actions proposed to strengthen the Ghanaian entrepreneurial and business ecosystem, taking the Canary Islands as a model.

Illustration 19 Initiatives to strengthen the entrepreneurial and business ecosystem.

Initiatives to strengthen the entrepreneurial and business ecosystem.



▶ **Canary Islands-Ghana Innovation and Entrepreneurship Network**

Facilitate connections between entrepreneurs, investors, and start-ups in both regions.

▶ **Joint Investment Funds**

Provide financial support for the expansion of tech startups and SMEs that want to internationalise.

▶ **Business Events**

Be a platform for startups to present their projects to investors.

▶ **Startup Accelerators**

Promote the growth of entrepreneurial projects through mentoring and access to international collaboration networks.

- Creation of a Canary Islands-Ghana Innovation and Entrepreneurship Network to facilitate the connection between entrepreneurs, investors and startups from both regions.
- Establishment of joint investment funds to support technology start-ups and SMEs in their expansion and internationalisation process.
- Organisation of business events and investment forums where Ghanaian technology companies can present their projects to Canarian investors.
- Development of startup accelerators, with mentoring and access to international collaboration networks to boost the scalability of entrepreneurial projects.

4. Digitalisation of trade and the productive sector

Trade and integration into international markets are key pillars for the development of the digital economy in Ghana. The Canary Islands, as a bridge between Africa and Europe, can facilitate the access of Ghanaian companies to digital trade platforms and advanced fintech solutions.

The image below shows the proposed actions for the digitalisation of Ghana's trade and production sector:

Illustration 20 Proposals for the digitisation of trade and the productive sector.

Digitisation of trade and the productive sector.



Cross-border e-commerce platforms

Connect Ghanaian SMEs with European markets for cross-border business opportunities.



Fintech Solutions

Implement digital payment and financing systems tailored to Ghanaian needs.



Supply Chain Digitisation

Improve efficiency and traceability in key sectors such as agribusiness.



Fintech Partnerships

Encourage collaborations between Canary Islands and Ghanaian fintechs for financial inclusion and digital commerce.

- Creation of cross-border e-commerce platforms that connect Ghanaian SMEs with European markets through the Canary Islands.
- Implementation of fintech solutions for digital payments and access to financing, adapted to the needs of Ghanaian entrepreneurs.
- Promoting the digitisation of the supply chain in key sectors such as agribusiness, with the use of digital tools to improve efficiency and product traceability.
- Establishment of alliances between Canary Islands and Ghanaian fintechs to develop financial inclusion and digital commerce solutions.

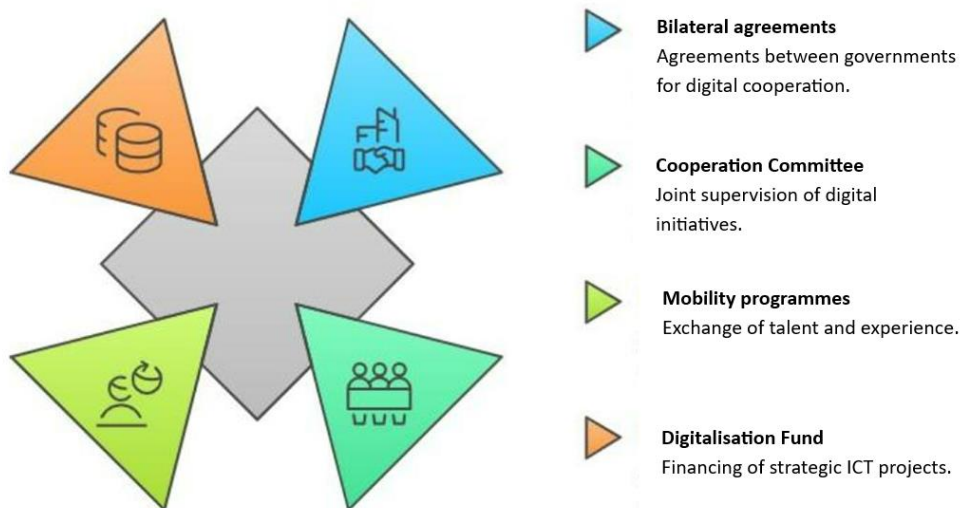
5. Establishment of institutional cooperation mechanisms

To ensure the success of the collaboration between Ghana and the Canary Islands, it is essential to establish solid cooperation mechanisms that facilitate the coordination of initiatives, the monitoring of projects and the evaluation of results.

The proposed actions are set out in the following figure:

Illustration 21 Initiatives for digital cooperation.

Initiatives for digital cooperation between Ghana and the Canary Islands.



- Bilateral agreements between the governments of Ghana and the Canary Islands for the promotion of the digital economy and technological innovation.
- Creation of a public-private cooperation committee, made up of representatives from both territories, to oversee the implementation of joint programmes.
- Implementation of mobility programmes for professionals in the digital sector, enabling the exchange of talent and experiences between Ghana and the Canary Islands.
- Establishment of a digitalisation cooperation fund, with contributions from public and private institutions, to finance strategic ICT projects.

8. Interviews with key Ghanaian stakeholders

Between 3 and 7 March 2025, thirteen meetings were held in Accra (and some online) with key actors in the field of digitisation, vocational training and employability in the technology sector. These meetings aimed to obtain an accurate diagnosis of the current state of digitalisation in the country, identify challenges and opportunities in digital skills and explore possible strategies to strengthen Ghana's technology and entrepreneurial ecosystem.

In a context of accelerated digital transformation, these meetings were fundamental to understand the needs of the different productive sectors, as well as the degree of alignment between the educational offer in digital skills and the demand of the labour market. The participation of government representatives, technology companies, educational institutions and international cooperation agencies allowed to gather a comprehensive view on the strategic priorities in the Ghanaian digital economy.

Below are the details of each of the meetings, including the topics discussed, the conclusions drawn and the areas of cooperation identified for strengthening the digital sector in Ghana:

1. iSpace

- Date: 3 March 2025
- Time: 09:30 AM
- Venue: Videoconference
- Participants:
 - Josiah Abakah Eyison (CEO of iSpace)
 - Edem Korshie Adzikah (CEL Ghana)
 - Navin Khemlani (IBC Spain)

Meeting notes

Edem Korshie Adzikah opened the meeting by thanking Josiah Abakah Eyison, CEO of iSpace, for his participation, highlighting his role as one of the key players in Ghana's digital ecosystem. It was explained that the interview was part of the EU-funded AfricanTech project with the following objectives:

- To assess the digital maturity of SMEs in Ghana.
- To identify training and employability needs in digitalisation.

Josiah Eyison presented his work on iSpace, an innovation hub based in Accra, which supports the growth of entrepreneurs and startups at different stages, collaborating with the public and private sector to improve the digital ecosystem.

Josiah explained that iSpace categorises companies into two groups:

1. Technology-focused companies: receive training in programming and platform development (HTML, C++, PHP, Python, Java, JavaScript).
2. Technologically enabled companies: they are trained in basic digital skills to improve their business, such as the use of social networks and digital tools.

The programmes offered by iSpace include:

- Digital skills training: use of tools such as WhatsApp and Facebook to improve online presence.
- Programming courses: intensive training in programming languages for technology entrepreneurs.
- Digital marketing training: differentiation between digital marketing and social media marketing.

iSpace offers various programmes to improve the digital literacy of SMEs, including:

- Invest in Her: programme aimed at women entrepreneurs in the technology sector.
- Code School: training in programming and digital literacy for informal sectors.
- Digital Skills 101: programme aimed at small entrepreneurs in the informal sector.
- Specific training for trade unions:
 - Example: training 150 members of the Ghana Beauty Association on digital marketing.

iSpace collaborates with different stakeholders to adapt its training programmes:

- Government: participates in the formulation of public policies for the digital ecosystem and proposes training.
- International agencies and NGOs: collaborate with Mastercard Foundation, GIZ and RISA for digital inclusion and gender programmes.
- Surveys and studies: conduct regular surveys to adjust training to the needs of the sector.

Example of collaboration:

- RISA (Gender Equality and Social Inclusion) project: training 22 women in the informal sector on how to use WhatsApp and Instagram to digitise their businesses.

Josiah shared some key indicators (KPIs) that reflect the impact of iSpace:

- Three-month follow-up after the training to measure the impact on businesses.
- Increased market reach of entrepreneurs after training.
- More than 1.500 entrepreneurs trained per year at different levels.
- High impact in the informal sector: iSpace is actively working with sectors traditionally excluded from digital transformation.

It was agreed that Josiah would mail more detailed KPIs to be included in the report.

To ensure the sustainability of its trainings, iSpace implements:

- Partial payment programmes: free training at basic levels, but advanced courses are at a nominal cost (USD 10 per course).
- Partnerships with the private sector: companies fund some programmes as part of their CSR.
- Structured documentation: creation of training manuals for beneficiaries to continue learning after completing the programmes.

iSpace fosters collaboration between startups and innovation hubs through:

- Monthly forums between technology hubs to share best practices.
- Ghana hub network, where iSpace takes the lead in coordinating joint initiatives.
- Collaborative projects to avoid duplication of efforts in digital training.
- Research and commercialisation of innovation with 25 hubs in Ghana.

Josiah highlighted iSpace's plans to expand its impact in Ghana:

- Design a national digital training programme for SMEs and entrepreneurs.
- Integrate new technologies into digital training, including:
 - Cloud Computing.
 - Business management systems (ERP, CRM).
 - Cybersecurity.
 - Artificial Intelligence applied to business (Chatbots, process automation).
- Promote the use of digital tools in the informal sector to improve the financial sustainability of SMEs.

iSpace is incorporating training in emerging technologies:

- AI applications in SMEs:
 - Use of ChatGPT for digital marketing.
 - Implementing chatbots on websites.
 - Using Trello and CapCut with AI for project and digital content management.

- Cybersecurity training:
 - Data protection and internet security training for SMEs.
- Business management systems:
 - Use of tools such as Siebel (CMS) and QuickBooks (accounting management) to improve SME efficiency.

It was noted that few SMEs use ERP and CRM due to:

- High implementation costs.
- Lack of awareness of their usefulness.
- Business ecosystem focused on products rather than services.

Josiah highlighted that the main obstacles to the adoption of digital tools in SMEs are:

- High cost of software and digital tools.
- Low culture of data collection in business.
- Lack of knowledge about the value of ERP and CRM systems.
- Difficulty in training companies that do not go to innovation hubs.

iSpace believes that the key to overcoming these challenges is to improve awareness and progressive adaptation of technology to local realities.

Conclusions

- Integrate impact KPIs into the report when they are submitted.
- Strengthen collaboration between iSpace and other hubs in Ghana.
- Explore partnerships with government to expand digital literacy.
- Improve awareness of the use of advanced business tools.
- Include emerging technologies in iSpace training offerings.

2. Micheal Osei Nkrumah, Consultant

- Date: 3 March 2025
- Time: 11:00 AM
- Venue: CEL Ghana
- Participants:
 - Micheal Osei Nkrumah (Consultant Researcher)
 - Edem Korshie Adzikah (Director of CE Ghana)
 - Navin Khemlani (IBC Spain)

Meeting Notes

On 3 March 2025, at 11:00 AM, a meeting was held at CEL Ghana with Micheal Osei Nkrumah, Consultant Researcher, and Edem Korshie Adzikah, Director of CEL Ghana. The purpose of the meeting was to discuss the challenges and opportunities in the digitisation of SMEs in Ghana, based on previous research and the experience of the attendees.

Micheal Osei Nkrumah started the meeting by presenting his experience as a researcher and consultant on digitalisation. He highlighted a recent study entitled 'Challenges and Opportunities to a Digitalized, Green, and Inclusive Environment for Entrepreneurs and Small Businesses', conducted in 2024 under the initiative of the Embassy of the Netherlands and the RVO agency. This study analysed the state of digitalisation in terms of infrastructure, adoption and internet penetration.

Key findings of their research were discussed, noting that Ghana has a strong policy and regulatory framework for digitisation, with multiple government- driven policies and strategies. However, the main problem lies in the implementation of these policies, due to lack of funding. The government faces budget shortfalls and prioritises other areas over investment in digital infrastructure.

Another major challenge identified was the lack of coordination between the various agencies working on digital. Many initiatives run in parallel, without a harmonized strategy, leading to duplication of efforts and waste of resources. The creation of a cluster bringing together the public, private and academic sectors was proposed to improve collaboration and efficiency of digital initiatives.

The digital divide between urban and rural areas was also addressed. In Accra, there is significant progress in the adoption of new technologies, but the rest of the country lags behind. Education and digital literacy remain critical challenges, especially in rural areas, where many students do not have access to computers.

Financing remains a key barrier to the digitisation of SMEs. The absence of tax incentives or subsidies to facilitate the adoption of technologies by small and medium-sized enterprises was highlighted. In addition, many digital startups rely on external funding and collapse once international donor support programmes end.

The private sector, while playing an important role in digitisation, is not sufficiently integrated into the country's strategic planning. It was mentioned that telecommunications companies lead innovation in digital solutions, but most SMEs have not yet adopted advanced tools such as artificial intelligence or blockchain.

Conclusions

1. Create a national fund for digitalisation, financed through a digital tax similar to the e-Levy, which would guarantee sustainable resources for the digital transformation of SMEs.
2. Overhaul the education system to integrate digital technology training from an early age and ensure that students have access to technological tools.
3. Promote public-private collaboration by creating clusters that include academia, the private sector and government agencies to improve coordination and implementation of digital strategies.
4. Implement tax incentives for SMEs investing in digital technologies, facilitating their access to finance and reducing their tax burden in the early years of digital adoption.
5. Encourage the use of technologies in agriculture and the green economy, promoting the adoption of digital solutions among farmers and agribusiness actors to improve productivity and sustainability.
6. Develop a national digitalisation plan with an allocated budget, ensuring its effective implementation and long-term sustainability.

The meeting concluded with a commitment to share relevant reports and documents to continue strengthening the knowledge on the state of digitalisation in

Ghana. The importance of working together to drive digital transformation was highlighted and the possibility of future collaborations between IBC Spain and stakeholders was left open.

3. Bluespace Innovation Hub

Date: 5 March 2025 (05/03/25) Time:

11:30 (GMT)

Venue: Kaperki Hotel, Accra, Ghana

Attendees:

- Navin Khemlani (IBC Spain)
- Edem Korshie Adzikah (Director of Center for Enterprise Learning - CEL Ghana)
- Samuel Amanor (CEO of Bluespace Innovation Hub)

Notes from the meeting

Navin Khemlani and Edem Korshie Adzikah welcomed Samuel Amanor and explained the purpose of the meeting: to analyse the digital maturity of micro, small and medium enterprises (MSMEs) in Ghana, identify digital skills gaps and assess opportunities to improve the digital ecosystem through joint initiatives.

Navin Khemlani presented the study as part of the EU-funded AfricanTech programme. He explained the importance of gathering information from key stakeholders in the private sector, public sector and academia to formulate strategies tailored to the needs of the Ghanaian digital ecosystem.

Samuel Amanor explained that Bluespace Innovation Hub operates as an innovation hub in the financial and fintech sector. Its focus is on digitising access to financial services by creating innovative technology solutions.

Bluespace operates under two brands:

- Bluespace Financial Cloud, which provides digital infrastructure for financial and government institutions.
- Bluespace Innovation Hub, which focuses on fintech product development and technology enablement.

The main products and services they offer include:

- Digital payment platforms.
- Solutions for insurance, trade finance and risk calculation.
- Integration with banks and government agencies to improve financial efficiency.

Samuel Amanor identified the main challenges faced by MSMEs in Ghana in adopting digital technologies:

1. High cost of digital infrastructure, especially cloud services.
2. Low digital literacy among entrepreneurs, hindering the adoption of technological tools.
3. Lack of funding for digitisation, as many startups and MSMEs cannot access credit or venture capital.
4. Lack of coordination in the fintech ecosystem, with multiple fragmented initiatives without a comprehensive vision.
5. Limited internet access in rural regions, hindering the expansion of e-commerce and digital services.

Bluespace has developed innovative strategies to address these challenges:

- Use of USSD and basic phones to facilitate the adoption of financial services without the need for internet.
- Specialised fintech training, with the Finsoft Tech Fellows programme, where they train young talent in financial technologies.
- Partnerships with the public and private sector, including the World Bank and MTN Ghana, to develop accessible digital infrastructure.
- Creation of a "Code Factory", where new talents experiment with emerging technologies such as artificial intelligence and blockchain.
- "Be Insured" platform, enabling entrepreneurs to obtain insurance quickly and affordably.

Navin Khemlani proposed the creation of a **digital cluster** bringing together public, private and academic entities. This cluster would allow:

- Optimise the use of investment funds.
- Coordinate digital training initiatives.
- Create high-impact projects with international funding.
- Reduce duplication of efforts in innovation hubs.

Samuel Amanor mentioned that Bluespace already works on similar initiatives with universities and the private sector, but acknowledged the lack of a formal coordinating body. He expressed his interest in collaborating to structure this initiative.

Strategies to accelerate the adoption of emerging technologies such as artificial intelligence, blockchain and big data in Ghanaian MSMEs were discussed.

Samuel Amanor explained that his organisation has a "Capital Factory", where fintech startups can receive support and mentoring to scale their businesses internationally.

It was mentioned that **collaboration with the European ecosystem could facilitate technology transfer** and generate opportunities for African startups in global markets.

Conclusions

- MSMEs in Ghana face key barriers such as the high cost of technology, lack of digital literacy and lack of coordination in the fintech ecosystem.
- Bluespace has implemented innovative solutions, such as fintech training, digitisation of financial services and collaborations with the public sector.
- The possibility of creating a digital cluster was explored to improve coordination and attract international funding.
- The need to boost the adoption of emerging technologies in the Ghanaian entrepreneurial ecosystem was identified.

4. Ghana Telecom University

College Date: 4 March 2025 (04/03/25)

Time: 13:45 (GMT)

Venue: Ghana Telecom University College

Attendees:

- Navin Khemlani (IBC Spain)
- Edem Korshie Adzikah (Director of Center for Enterprise Learning - CEL Ghana)
- Derrick Ofori Donkor (Ghana Telecom University College)

Meeting notes

Edem Korshie Adzikah welcomed Derrick Ofori Donkor and explained the purpose of the meeting: to conduct an interview in the framework of the study on the digital maturity of micro, small and medium enterprises (MSMEs) in Ghana. This study has also been carried out in other countries, such as Côte d'Ivoire, and is currently underway in Mauritania and Senegal.

Navin Khemlani presented the EU-funded project, which aims to identify opportunities for collaboration between Spanish and African companies in the field of digitalisation and technological inclusion of MSMEs.

The importance of equal cooperation with the local ecosystem, including public institutions, universities and the private sector, was highlighted.

Derrick Ofori Donkor explained that the university is part of a consortium focused on innovation and development of technology startups. Its activities include training in digital technologies, mentoring and coaching entrepreneurs, connecting with investors through investment matching programmes, and coworking and incubation spaces.

Training programmes include financial literacy, digitisation of business operations, e-commerce, fintech and digital marketing, as well as training in artificial intelligence, machine learning and cybersecurity. In the past, these programmes have been funded by the World Bank and have benefited entrepreneurs in various regions of Ghana.

The main obstacles identified in the digitisation of MSMEs include lack of funding, deficiencies in human capital, little training in emerging technologies and little collaboration with the government sector.

The university measures the impact of its programmes through surveys, startup monitoring, periodic evaluations and hackathons.

The university collaborates with various institutions such as AmaliTech Ghana and the Ghana Ministry of Education, seeking international funding and developing coworking spaces and technology labs.

Plans include expanding the coworking space, developing certifications in AI and blockchain, strengthening the tech startup investment ecosystem and creating an investment fund to support students with innovative ideas.

Conclusions

Ghana Telecom University College plays a key role in the digitisation of MSMEs in Ghana. Barriers such as lack of funding and deficiencies in human capital were identified. It was agreed to maintain contact to share progress on the report and explore opportunities for cooperation in digital training.

5. IoT Network Hub s Ghana STEM

Network Meeting Minutes Joshua Opoku

Agyemang Date: 3rd March 2025

Time: 15:30

Venue: IoT Network Hub, Accra, Ghana

Attendees:

- Joshua Opoku Agyemang (Chairman C CEO of IoT Network Hub C Ghana STEM Network)
- Edem Korshie Adzikah (CEL Ghana)
- Navin Khemani (IBC Spain)

Notes from the meeting

The meeting took place at the IoT Network Hub premises in Accra, where Joshua Opoku Agyemang hosted us to discuss the current state of digitalisation and opportunities in Ghana within the framework of the West African SME digital maturity study. During the meeting, various aspects related to training in emerging technology, the adoption of digital solutions by SMEs, and sustainability strategies for digitalization in the business ecosystem were addressed.

Joshua began by introducing the IoT Network Hub, a space dedicated to the training and development of technology solutions in Ghana. Founded in 2016, the Hub has become a key hub for innovation, learning new technologies and digital skills training. They currently have over 30.000 young people in their network, with a presence in 20 African countries and multiple chapters in universities.

The Hub offers free monthly training programmes, where practical workshops on web development, programming and digitalisation are given to entrepreneurs and students. In addition, they have developed a STEM learning education kit, with the aim of preparing young people aged 8-25 in key areas such as artificial intelligence, robotics and the internet of things (IoT). This kit has been adopted in several schools and has proven to be an effective tool for digital education.

The Hub operates under a self-financing model, combining the sale of its educational kits with training programmes in schools and agreements with international organisations. They have received funding from organisations such as UNICEF and Orange Ghana, and recently participated in the Mastercard ITEC Fellowship programme. In addition, they have implemented a 'Venture Studio' model to incubate and develop technology startups within their ecosystem, ensuring their long-term growth.

One of the main challenges facing digitalisation in Ghana is the lack of awareness and education on the benefits of technology. Many entrepreneurs perceive digitisation as an abstract concept or of little relevance to their business. In addition, resistance to change, lack of adequate technology infrastructure and the cost of connectivity remain significant barriers.

To measure the impact of its training programmes, the Hub conducts pre- and post-training evaluations to measure participants' progress. They also implement hands-on projects and encourage collaboration in teams, which allows for the development of communication and teamwork skills. The retention rate of participants is a key indicator of the programme's success.

The Hub plans to expand through the creation of a 'Living Lab', an open innovation space where companies, entrepreneurs and students can develop prototypes and technological solutions. In addition, they are working on organising a national hackathon to bring together all innovative initiatives under one event, thus promoting greater coordination between ecosystem actors.

The Hub has identified a low level of female participation in its programmes, so they have implemented specific strategies to address this gap. They have established partnerships with women-led organisations and have launched training programmes exclusively for women technology entrepreneurs. They have also received support from international foundations to promote women's access to the technology sector.

The meeting concluded with the recognition that digitalisation is an essential process for the growth of SMEs in Ghana. However, lack of funding, resistance to change and low infrastructure remain critical barriers. The possibility of strengthening partnerships with international entities to encourage technological adoption in the country was discussed. IoT Network Hub remains committed to innovation and digital education as key pillars for the development of the entrepreneurial ecosystem in Ghana.

6.Hopin Academy

Date: 7 March 2025 (07/03/25) Time:

11:45 (GMT)

Venue: Videoconference

Attendees:

- Navin Khemlani (IBC Spain)
- Edem Korshie Adzikah (Director of Center for Enterprise Learning - CLE Ghana)
- Muniratu Abdoulaye (Startup Program Officer, Hopin Academy)

Academy) Notes of the meeting

Edem Korshie Adzikah opened the meeting by acknowledging the presence of Muniratu Abdoulaye, who was indisposed, but decided to participate to support the work in progress. Navin Khemlani explained the objectives of the two reports being developed under the EU-funded AfricanTech project, which addresses:

1. The digital maturity of SMEs in Ghana.
2. The training and employability needs in digitalisation.

The importance of listening to key players in the digital ecosystem was highlighted in order to enrich the study with first-hand information.

Muniratu Abdoulaye explained that Hopin Academy is an institution based in Tamale, Northern Ghana, focused on:

- Incubation and training of start-ups in sectors such as fintech, agritech, health, logistics, among others.
- Entrepreneurship training programmes for entrepreneurs who want to scale their ideas and turn them into sustainable businesses.
- Mentoring and integration into the ecosystem to ensure that companies have a viable path to sustainability.

The incubation programme lasts four months and offers training, mentoring and industrial adaptation to help entrepreneurs improve their business models.

Hopin Academy offers a variety of educational and digital training programmes, including:

- Phaba in Tech: specific training for young women, regardless of whether they are entrepreneurs or want to acquire new digital skills. It has been implemented in Tamale, Wale Wale and Damango.
- Digital Taskforce Training: training in basic digital skills, including:
 - Using email.
 - Creating documents in the cloud.
 - Developing digital presentations.
 - Use of online collaboration platforms.
- Peer-to-Peer Learning: sessions in which participants themselves teach digital skills to their peers.

These programmes aim to bridge the digital divide in northern Ghana, where access to technology and training is more limited compared to other regions of the country.

Muniratu explained that the academy operates with different funding models:

- Hopin Academy internal funds.
- Support from international partners, although not always fully funded.

- Specific externally funded projects, such as Phaba in Tech.
- Training programmes are free for entrepreneurs, eliminating economic barriers to access.

Hopin Academy not only trains entrepreneurs, but which maintains a continuous accompaniment through:

- Constant mentoring to help them develop their businesses.
- Access to funding for outstanding projects.
- Creation of the Hopin community, where alumni continue to participate in events, meetings and continuous training opportunities.
- Networking with companies and other entrepreneurs.

Muniratu identified several key challenges:

1. Lack of access to computers:

- The academy has a limited number of computers.
- Students who do not have a computer at home cannot practice outside of class.
- A pair work model is implemented, but it is still a limitation.

2. Infrastructure problems:

- Frequent power cuts hinder digital training.
- Limited internet access: they use Starlink, but it depends on electrical stability.

3. Cost of internet:

- Mobile data is expensive, which prevents many students from continuing their training at home.
- The academy does not offer specific scholarships to cover these costs.

Hopin Academy has programmes aimed exclusively at women, such as Phaba in Tech, which trains 300 women in digital skills and entrepreneurship.

- Other programmes are co-educational, but ensure gender parity in the selection of participants.

Hopin Academy has played a key role in the development of entrepreneurship in northern Ghana:

- Over 250 businesses incubated and graduated.

- Survival rate of 80% of incubated businesses.
- Job creation: start-ups formed have generated employment opportunities.
- Continuous monitoring and evaluation:
 - Hopin regularly visits its alumni to evaluate their performance.
 - Established companies within the Hopin ecosystem offer mentoring to new generations.

The sectors in which most entrepreneurs are currently being trained include:

- Agritech.
- Energy and sustainability (Green Business).
- E-commerce.
- Waste Management (E-Waste Management).
- HealthTech.

Each year, Hopin adapts its programmes according to market trends and needs.

- Hopin Academy has a satellite location in Wale Wale (North East Ghana).
- They are exploring collaborations with other hubs in different regions to expand their impact.

Hopin Academy does not offer advanced technical training in AI, cybersecurity or blockchain, but:

- They organise awareness workshops on these topics.
- In 2024 they ran a session on cybersecurity and data protection for SMEs.
- They are looking to incorporate more content on emerging technologies in the future.

Hopin Academy has developed the digital commerce platform "Danni", which allows entrepreneurs:

- Sell products online without intermediaries.
- Learn how to manage their shops on digital platforms.

- To be trained in digital sales strategies and social networks.

Conclusions

- Strengthen funding for computer acquisition and improved connectivity.
- Explore strategies for mobile data access grants.
- Expand training in new technologies such as AI and cybersecurity.
- Strengthen follow-up of incubated companies to improve their success rates.
- Foster collaboration between Hopin Academy and other hubs in Ghana.

7. CSIR Institute Meeting Minutes

Date: 04 March 2025

Time: 10:00 AM

Venue: CSIR Institute, Ghana

Participants:

- Nana Kofi Safo, Senior Researcher, CSIR Institute
- Navin, IBC Spain
- Edem Korshie Adzikah, Director, CEL Ghana

Meeting notes

The meeting was held at CSIR Institute with the objective of analysing the digital maturity of SMEs in Ghana, understanding the challenges and opportunities facing the business ecosystem and discussing possible strategies to strengthen digitisation and capacity building in emerging technologies.

Introducing CSIR and its impact on the innovation ecosystem Nana Kofi Safo started the meeting by explaining the structure and scope of the Council for Scientific and Industrial Research (CSIR), a key body in the development of science and technology policy in Ghana. CSIR currently has 13 institutes and 64 research centers spread across the country, focusing on diverse areas such as agriculture, technology and industrial policy.

The Science and Technology Policy Research Institute (STEPRI), where the meeting was held, focuses on the development and evaluation of government policies related to science, technology and innovation.

Recently, in collaboration with the Ministry of Environment, Science, Technology and Innovation (MESTI) and with the support of UNESCO, STEPRI has updated the national science, technology and innovation (STI) policy for the period 2024-2030, currently under approval by the government cabinet. One of the key projects mentioned at the meeting was the National Entrepreneurship and Innovation Program (NEIP), which provided training and funding to SMEs. STEPRI was appointed to evaluate the impact of the programme and conducted surveys and interviews with beneficiaries in various regions such as Accra, Kumasi and Tamale.

The key findings were:

- The positive impact of the training, with beneficiaries highlighting improvements in customer management, resource optimisation and business digitalisation.
- The inadequacy of the funding provided, with amounts ranging from 1.000 to 2.000 cedis (with some exceptions), which limited the real impact on business expansion.
- Increased use of digital tools by beneficiaries, mainly in advertising through social media and transactions via mobile phones and digital wallets.

Several challenges were identified that prevent greater adoption of digital technologies among SMEs:

- High data costs and limited access to connectivity.
- Low digital literacy, with many entrepreneurs relying on family members to conduct transactions or manage social networks.
- Lack of funding for the purchase of appropriate technology (smartphones, management software, etc.).
- Resistance to change and lack of confidence in digital tools.

During the discussion, several initiatives were proposed to overcome the obstacles:

1. Creation of a National SME Digitisation Barometer, in collaboration with the Ghana Chamber of Commerce, to annually measure progress in digitisation and put pressure on government to implement effective policies.

2. Training in artificial intelligence applied to SMEs, including tools such as ChatGPT for market research, task automation and process optimization.
3. Development of accessible digital training platforms in local languages, enabling less digitally literate entrepreneurs to benefit from new technologies.
4. Training key intermediaries, such as farmers' associations and cooperatives, so that they can transfer AI and digitalisation knowledge to their members.
5. Creation of a digitisation support fund, with public and private funding, to facilitate access to advanced technologies at affordable costs.

Conclusions

The meeting concluded with a commitment to collaboration between CSIR-STEPRI and IBC Spain to further explore joint solutions in the field of digitisation and capacity building in Ghanaian SMEs. It was agreed to:

- Share additional information on the DISS-G project and other documents of interest.
- Assess the feasibility of the proposals presented and their possible implementation in future initiatives.
- Maintain a fluid dialogue to explore sources of funding for these projects.

8. PAMEPI Women in Tech

Date: 4 March 2025 (04/03/25) Time:

11:40 (GMT)

Venue: Videocall

Attendees:

- Navin Khemlani (IBC Spain)
- Edem Korshie Adzikah (Director, Center for Enterprise Learning - CEL Ghana)
- Alberta Ferguson (Program Admin, PAMEPI Women in Tech)

Meeting Notes

Edem Korshie Adzikah welcomed Alberta Ferguson and explained the purpose of the meeting: to conduct an interview in the framework of the digital maturity study of the micro, small and medium enterprises (MSMEs) at Ghana. It was mentioned that this study is also being conducted in other countries, and that Ghana is the only English-speaking country in which the Spanish government is supporting this research.

Navin Khemlani presented the two main reports under development:

1. Digital Maturity of MSMEs in Ghana.
2. Employability and digitisation training needs for MSMEs.

Khemlani highlighted the importance of listening to all stakeholders involved in the digitalisation value chain and the key role of PAMEPI Women in Tech in this process.

Alberta Ferguson presented her organisation, explaining that its goal is to reduce the gender gap in technology and empower women in the tech sector. She emphasised the importance of the inclusion of women in tech in various industries, not only in STEM, but also in sectors such as accounting and medicine. Among the initiatives they are carrying out are:

- Trainings and training programmes for women in technology.
- Projects in institutes and universities to encourage female participation in technology careers.
- Accompanying women entrepreneurs and supporting them in the creation of digital products and solutions.
- Encouraging the use of technology in all sectors of the workplace.

Ferguson indicated that on 24 March 2025 they will launch the first edition of the Agri Women in Tech programme, focused on the digitisation of the agricultural sector and the empowerment of women in agribusiness. She highlighted that this event will take place at the University of Ghana and invited attendees to participate. The main components of the programme include:

- Training in technology and digitalisation applied to the agricultural sector.
- Digital marketing for international markets.
- Mentoring by international leaders in technology and business.

- Access to funding and investment opportunities, with the support of international partners, including Beyoncé's BeyGood foundation and other organisations in the USA.

- International exchange programmes for women entrepreneurs.

- Innovation in business ideas and technology applied to agriculture. The institution evaluates the impact of its programmes through:

- Monitoring and evaluation of participants' performance.
- Follow-up of the impact on their business and daily lives.
- Ongoing mentoring to ensure the application of knowledge.

Since its foundation, they have trained more than 350 women, according to preliminary data. Among the main challenges they have identified are:

- Lack of funding to expand their programmes.

- High digitalisation costs, which hinder the adoption of technology by women entrepreneurs. To promote women's employability in technology, PAMEPI collaborates with:

- AmaliTech Ghana, which trains and employs tech talent.

- Embassies of Switzerland, Germany and Turkey, with whom they have developed initiatives such as the "Advancing Girls' Rights through Digital Technology" programme and entrepreneurship competitions in Sunyani.

- Ghana's Ministry of Education, with whom they have worked on outreach programmes, although without direct funding.

As for the financial sustainability of the organisation, they depend mainly on international funds and collaborations with public and private institutions.

Conclusions

- PAMEPI Women in Tech seeks to promote the participation of women in technology from secondary education to the professional world.

- Interest was identified in digitisation programmes for the agricultural sector, with opportunities for training, mentoring and funding.

- Alberta Ferguson will provide more information on ongoing and future programmes.

- The possibility of collaborating on future initiatives to enhance the digitization of women entrepreneurs in Ghana will be explored.
- It was agreed to maintain contact to share progress on the report and future opportunities for collaboration.

G. Ghana Chamber of Young Entrepreneurs (GCYE)

Date: Monday, 3 March 2025 Time:

14:15

Venue: Ghana Chamber of Young Entrepreneurs (GCYE) Participants:

- Sherif Ghali Abdulai, President of the Ghana Chamber of Young Entrepreneurs (GCYE)
- Edem Korshie Adzikah, Director of CEL Ghana
- Navin Khemani, CEO of IBC

Spain Meeting notes

The main objective of the meeting was to learn about the work of the Ghana Chamber of Young Entrepreneurs (GCYE) in the field of digitisation of micro, small and medium enterprises (MSMEs) in Ghana, as well as its role in training and supporting young entrepreneurs. The conversation focused on identifying the challenges faced by start-ups in the process of adopting digital technologies, as well as possible strategies to address these difficulties.

Navin Khemani explained that the research being conducted by IBC Spain is being carried out in four African countries, including Ghana, the first English-speaking country to join the study after Mauritania. The purpose of the research is to assess the digital maturity of MSMEs and analyse the skills gaps in order to propose interventions to improve the competitiveness and digitisation of entrepreneurs.

Sherif Ghali Abdulai explained that GCYE conducts multiple activities focused on strengthening the digital capabilities of young entrepreneurs in Ghana. He noted that every year they conduct an assessment of the areas where their members face the greatest challenges in terms of technology and digitisation. Based on these results, they design training and capacity building programmes.

For example, in recent years, they identified cybersecurity as a critical issue, with many young businesses suffering from cyber attacks due to the lack of knowledge

about how to protect themselves online. In response, the GCYE developed a nationwide training programme with the support of German Incubation to educate entrepreneurs about digital security.

One of the key points discussed was the existence of three major barriers to the digitisation of MSMEs in Ghana, referred to as the 'three A's':

- Availability: there are still areas of the country without internet access, which greatly limits digitisation.
- Affordability: the cost of internet in Ghana is one of the highest in West Africa, making it difficult for small entrepreneurs to stay connected.
- Accessibility: Many entrepreneurs do not have adequate devices, such as computers or smartphones, which restricts their access to digital tools.

In addition to these barriers, the lack of technical knowledge and adequate training is a significant obstacle to the adoption of new technologies.

Sherif Ghali mentioned several initiatives that the GCYE has implemented to address these challenges, including the creation of a technology advisory service where members can request assistance in website creation, social media management and graphic design. He also highlighted the need for greater coordination between the public and private sector to enhance digital opportunities for entrepreneurs.

Navin Khemani proposed the possibility of structuring a tax incentive programme for companies investing in technology, following successful models implemented in other countries, such as Spain.

As a result of the meeting, it was agreed that the GCYE will distribute the online survey prepared by IBC Spain among its members to gather detailed information on the state of digitisation of MSMEs in Ghana. In addition, Sherif Ghali committed to share the previous assessment reports conducted by the GCYE, which will serve as input for the ongoing research.

Conclusion

The meeting was highly productive and validated many of the previous findings of the study on the digital maturity of MSMEs in Ghana. The importance of improving connectivity, reducing internet access costs and promoting more training in digital tools for entrepreneurs was reaffirmed. Opportunities for future collaboration between GCYE and IBC Spain were also identified to foster the digitisation of the entrepreneurial ecosystem in Ghana.

10. Soronko Academy

Date: 4 March 2025 (04/03/25) Time:

15:30 (GMT)

Place: Soronko Academy, Ghana

Attendees:

- Navin Khemlani (IBC Spain)
- Edem Korshie Adzikah (Director, Center for Enterprise Learning - CEL Ghana)
- Regina Honu (CEO of Soronko Academy)

Notes from the meeting

Edem Korshie Adzikah presented the purpose of the meeting: to analyse the digital maturity of micro, small and medium enterprises (MSMEs) in Ghana, assess digital skills gaps and determine training needs to improve employability in the digital sector. The importance of gathering information from all key stakeholders, including academia, the private sector and the public sector, was highlighted.

Navin Khemlani explained that the study is part of the EU-funded AfricanTech project, which is also being developed in Côte d'Ivoire, Senegal and Mauritania. She expressed her interest in learning about the work of Soronko Academy and its impact on the digital literacy of women in Ghana.

Regina Honu presented Soronko Academy as an organisation specialising in coding and digital skills training, with a focus on bridging the gender gap in technology. She highlighted that its programmes are designed to train women in digital skills demanded by the labour market, provide training in soft skills and entrepreneurship, and facilitate job placement and access to business opportunities for its female students.

Soronko Academy offers programmes at different levels of difficulty:

Intermediate level:

- Digital Marketing
- Web development
- Graphic design
- Content creation and social media

Advanced level:

- Python programming
- Artificial intelligence
- Data science and analytics
- Cybersecurity (soon to be implemented)

Soronko Academy is in constant contact with employers to align its training programmes with the needs of the market. It is currently implementing a strategy whereby before starting a training, they negotiate with companies to hire graduates, guaranteeing job opportunities.

Another key factor is its collaboration with global companies for the remote recruitment of its female trainees. Currently, 130 women are working on digital micro-tasks for an international company.

The main challenges that face Soronko Academy include:

- Funding: The academy is funded by partners such as Mastercard, MPN and the Internet Society Foundation. However, contract renewal and fundraising are constant challenges.
- Affordability: Many students cannot afford their training. The cost of a course can be as high as \$2,500, forcing the academy to seek external funding.
- Infrastructure and connectivity: High data costs and lack of access to devices limit the participation of many women, especially in rural areas.
- Cultural stereotypes: Traditional ideas still persist that hinder women's participation in technology, such as the belief that an empowered woman loses her "place" in the family.

Soronko Academy has implemented strategies to ensure the inclusion of women in technology, such as:

- Flexible trainings tailored to the needs of women with family responsibilities.
- Childcare spaces, allowing mothers to attend with their children.
- Trainings at regions rural regions**, at partnership with hubshubs.
- Inclusion of people with disabilities, although they are still working on improving their infrastructure to ensure full accessibility.

It was proposed to establish links with Business C Professional Women (BPW), a global network of professional and entrepreneurial women based in Africa.

Regina Honu also mentioned her involvement in government initiatives. In 2024, Soronko Academy was included in the national budget as one of the key institutions to accelerate the digital economy, although they have not yet received cash funding.

Conclusions

- Soronko Academy plays a crucial role in the digital training of women in Ghana, with a significant impact on employability and entrepreneurship.
- Barriers such as funding, accessibility and cultural stereotypes were identified.
- It was proposed to strengthen collaboration with international actors and seek greater integration with government initiatives.
- Connection with BPW will be explored to expand support networks and opportunities for graduates.
- The importance of fostering partnerships between technology hubs, private sector and public sector to increase the impact of digital literacy in Ghana was highlighted.

11. Ghana Hubs Network

Date: 5 March 2025 (05/03/25) and 7 March 2025 (07/03/25) Time: Part

One: 13:15 (GMT) | Part Two: 12:30 (GMT)

Venue: University of Ghana (first meeting), Videoconference (second meeting).

Attendees:

- Navin Khemlani (IBC Spain)
- Edem Korshie Adzikah (Director of Center for Enterprise Learning - CEL Ghana)
- Yaw Adu-Gyamfi (Chairperson of Ghana Hubs Network)

Notes from the meeting

Yaw Adu-Gyamfi welcomed and outlined the purpose of the meeting: to assess the digital maturity of micro, small and medium-sized enterprises (MSMEs) in Ghana, identify digital skills gaps and explore opportunities for coordination and improvement of the digital ecosystem in the country.

Navin Khemlani presented the study as part of the EU-funded AfricanTech project involving Ghana, Senegal, Mauritania and Côte d'Ivoire. He explained the

importance of gathering information from all key stakeholders, including the private sector, the public sector and academia, to develop proposals aligned with the needs of the Ghanaian digital ecosystem.

Yaw Adu-Gyamfi explained that Ghana Hubs Network (GHN) is a network of 100 hubs in the 16 regions of the country, providing support through:

- Strengthening hubs' business models and operations.
- Financial, operational and programmatic resilience, ensuring long-term sustainability.
- Fostering access to markets and funding through investors and support programmes.

Challenges in terms of financial and operational sustainability were identified.

- GHN is financed through fixed annual membership fees, consultancy, grants and corporate support.
- It is proposed to strengthen the certification of hubs to standardise and improve the quality of services.
- The possibility of a network of experts to support hubs in different areas was discussed.

GHN is collaborating with GFA and GIZ on digital literacy programmes focusing on:

- Women entrepreneurs and informal sector businesses.
- Use of digital platforms in local languages and with video and voice support.
- Community radio programmes to train MSMEs in digital technology.

Discussed the need to develop:

- A digital directory of startups and hubs, accessible by subscription.
- A hub certification system, based on criteria such as:
 - Legal registration in Ghana.
 - Training of managers and programme managers.
 - Sustainable business models and training offerings.
 - Compliance with government regulations and best practices. Navin

Khemlani proposed the creation of a digital cluster that brings together:

- Technology hubs.

- Private companies in the digital sector.
- Universities and training centres.
- Government representatives and funding agencies.

GHN is establishing partnerships with hub networks in East Africa, starting with hubs in Kenya to:

- Knowledge exchange in digital innovation and circular economy.
- Strengthening startups with opportunities under the AfCFTA (African Free Trade Agreement).
- Developing joint programmes in green and digital innovation.

It was confirmed that the annual Ghana Hubs Network event will be held on 24-25 July 2025 in Accra, where:

- All hubs in the country will come together.
- Present success stories and innovative programmes.
- Encourage interaction with investors and strategic partners.

Conclusions

- Assess the feasibility of hub certification and the digital directory.
- The creation of the digital cluster will be explored to improve ecosystem coordination.
- Synergies with Kenya and other international networks will be strengthened.
- Progress will be made in formalising strategic alliances with funding agencies.
- Participation in the annual Ghana Hubs Network event in July will be organised.

The meeting ended with a commitment to continue discussions and strengthen collaboration between IBC Spain and Ghana Hubs Network.

12. MDF Africa/CEL Ghana

Date: 5 March 2025 (05/03/25)

Time: 09:45 (GMT)

Venue: Ghana

Attendees:

- Navin Khemlani (IBC Spain)
- Edem Korshie Adzikah (director of Center for Enterprise Learning - CEL Ghana)
- Richard Yeboah (CEO of MDF Africa, manages CEL Ghana)

Notes from the meeting

Edem Korshie Adzikah welcomed and outlined the purpose of the meeting: to assess the digital maturity of micro, small and medium enterprises (MSMEs) in Ghana, identify digital skills gaps and explore opportunities for coordination and improvement of the digital ecosystem in the country.

Navin Khemlani presented the study as part of the EU-funded AfricanTech project involving Ghana, Senegal, Mauritania and Côte d'Ivoire. He explained the importance of gathering information from all key stakeholders, including the private sector, the public sector and academia, to develop proposals aligned with the needs of the Ghanaian digital ecosystem.

Richard Yeboah noted that the changes in government have had a significant impact on the Ministry of Communication and Digitisation. He mentioned that after the change of administration, most employees were relieved of their duties, which affected the continuity of projects and made networking with the new government team difficult.

The implications of these changes for policy formulation and collaboration with international partners were discussed. The need to maintain a neutral and professional position was emphasised in order to avoid being identified as aligned with a specific administration, which could affect future collaboration opportunities.

Navin Khemlani explained that the study aims to:

- Show Canary Islands companies and institutions the opportunities in Ghana, Senegal, Mauritania and Côte d'Ivoire.
- Provide local institutions with an updated analysis of the digital ecosystem and its main challenges.

- The main challenges of the digital ecosystem in Ghana were identified:
- High cost of data access and connectivity.
- Lack of internet infrastructure in rural regions.
- Gender gap in technology.
- Deficiencies in digital literacy and talent training.
- Lack of coordination among actors in the digital ecosystem.

The creation of a digital cluster was proposed that includes all key actors: public sector, private sector and academia. This cluster could help optimise the use of investment funds, facilitate collaboration between different hubs and startups, and design higher impact projects for funders such as Mastercard, the World Bank and the French Development Agency.

Soronko Academy was mentioned as a successful example of technology training for women. The academy works closely with MSMEs to identify their needs before designing training programmes, ensuring a direct link between training and market demand.

Navin Khemlani explained how artificial intelligence (AI) has been used to improve efficiency in reporting and market research. It was highlighted that companies should adopt AI, blockchain and other emerging technologies to improve their competitiveness, and that the use of AI in proposal writing can significantly reduce work time and increase productivity.

It was proposed to develop an annual digital barometer in collaboration with the Ghana Young Entrepreneurs Chamber of Commerce. This study could provide up- to-date data on the digital needs of MSMEs, key indicators on the adoption of emerging technologies and a tool to improve government and business decision- making.

Findings

- It was confirmed that Ghana's main challenges in digitisation include:
- High data cost.
- Lack of connectivity in rural regions.
- Gender gap in the technology sector.
- Weaknesses in digital literacy.
- Lack of coordination among stakeholders in the digital ecosystem.
- Explore the creation of a digital cluster.
- Replicate the Soronko Academy model to strengthen digital training.

- Promote the use of AI and emerging technologies.
- Develop a digital barometer to improve the monitoring of the digital maturity of MSMEs.

13. Ghana's Ministry of Communication, Digital Technology and Innovation

Date and time: 5 March 2025, 15:30 (GMT)

Venue: Ministry of Communication, Digital Technology and Innovations, Ghana

Attendees:

Navin Khemlani (IBC Spain)

Edem Korshie Adzikah (Director of Center for Enterprise Learning - CEL Ghana)

Victor Adadjie (Monitoring and Evaluation Practitioner at eGhana Project, Ministry of Communication, Digital Technology and Innovations)

Rebeca Okai Hamond (Tender Specialist at the Ministry)

Meeting notes

The meeting aimed to review the digitisation strategies and programmes implemented by the Ministry of Communication, Digital Technology and Innovations of Ghana within the framework of the eGhana Project and to discuss the role of digitisation in the development of micro, small and medium enterprises (MSMEs) in Ghana.

Navin Khemlani presented the EU-funded AfricanTech project, which covers Ghana, Senegal, Mauritania and Côte d'Ivoire, highlighting the need to study the level of digital maturity of MSMEs and detect digital skills gaps.

Victor Adadjie explained that the eGhana Project, funded by the World Bank, had three main components:

- Strengthening the digital environment: setting up the Accra Digital Centre to improve the digital infrastructure in the country.
- Priority e-application development: training in the use of digital platforms.
- Youth support and digital entrepreneurship: training of young people in digital skills to foster employability.

The Accra Digital Centre, which cost \$8.8 million (funded in part by the Rockefeller Foundation and the World Bank) has become an innovation hub for major technology companies. In addition, two dedicated buildings were set aside for the training of young people in digital skills.

Based on the success of the project, the Ghana Digital Acceleration Project was launched in 2024, with a budget of USD 6 million to continue training in digitalisation and entrepreneurship.

From 2018 to 2024, the digital training programmes trained 30.000 youth through hubs such as Ghana Innovation Hub, Ghana Tech Lab and Kumasi Business Incubator.

Of those trained, 5.799 found employment directly:

- Males: 2.756
- Women: 3.043

The rest started their own projects or are self-employed.

The new Ghana Digital Acceleration Project will focus on training an additional 15.000 young people in two and a half years, with a target employability rate of 20%.

Rebeca Okai Hamond explained the recruitment process for the new digitisation programme within the Ghana Digital Acceleration Project:

Initially a direct recruitment was proposed for the hubs that had already worked in the previous phase.

However, the World Bank requested a new competitive process.

The TOR is being redefined to open a new tender with proven experience criteria.

Additional evaluation points will be awarded to hubs with previous experience in similar projects.

The following challenges in the digitisation of MSMEs were identified: Access to digital infrastructure.

Internet coverage: 70% coverage is estimated, but the quality of service in rural areas remains low.

Data costs: remain high compared to other countries in the region.

Rural-urban digital divide: 22% of households have internet access and only 16% own a computer.

Lack of training in digital skills.

The importance of training MSMEs in the use of digital tools was highlighted.

The creation of a national digitalisation training programme for MSMEs was proposed, in collaboration with universities and the private sector.

Navin Khemlani proposed the creation of a National Digital Cluster, bringing together:

The public sector (Ministry of Communication, Ministry of Commerce and Ministry of Education).

The private sector (technology companies and innovation hubs).
Universities and training centers.

International organisations such as the World Bank and the Mastercard Foundation. The objective of the cluster would be:

Coordinate digitisation strategies in the private and public sector.

Optimise investment in digitisation by avoiding duplication of efforts.

Encourage collaboration between hubs, companies and government entities.

The possibility of seeking funding for this cluster through the World Bank, the African Development Bank and international cooperation agencies was raised.

Possible incentives to encourage the digitisation of MSMEs were discussed:

- Grants and soft financing for technology acquisition.
- Tax incentives for companies investing in digitisation.
- Access to free training platforms on digitisation and e-commerce.

Currently, the ministry does not offer direct tax incentives, but international benchmarking was recommended to assess their feasibility.

Initiatives to expand digital access in rural areas were reviewed:

- Ghana Electronic Communications Investment Fund, which has connected 2,016 communities in the last 8 years.
- Plan to connect an additional 500 communities in the coming years.
- Expansion of the e-justice system and the government's digital payments platform.

Conclusions

- Revise the term of reference (TOR) of the new digitisation programme for MSMEs, ensuring that companies with previous experience have a competitive advantage.
- Explore the feasibility of a National Digital Cluster, promoting better coordination between the public sector, private sector and academia.
- Identify sources of funding for the digitisation of MSMEs, including tax incentives and international grants.
- Improve communication between the ministry and technology hubs, ensuring that the needs of the private sector are heard.
- Explore partnerships with the Mastercard Foundation and other international actors to improve access to digital training for entrepreneurs and MSMEs.

8.1. Conclusions and main findings from the interviews conducted

The meetings held in Ghana have allowed gathering key information on the state of digitisation of SMEs, the challenges of training and employability in the digital sector, and the coordination of the technology ecosystem. Meetings with innovation hubs, universities, government agencies and business networks have confirmed previous findings and provided new insights into the barriers and opportunities in the Ghanaian digital ecosystem.

In particular, structural challenges such as limited access to funding for digitisation, lack of training in emerging technologies, fragmentation of the innovation ecosystem and the need for more integrated strategies for the country's digital transformation have been identified. The importance of improving digital infrastructure and connectivity in rural areas, as well as the inclusion of women in technology, have also been recurrent themes in the meetings.

Below are the conclusions organised into key themes:

1. Inequality in digital adoption: a significant gap is observed between advanced sectors such as fintech and telecommunications, versus others such as agriculture and manufacturing, which continue to lag behind in digitisation. Fintech startups have made significant progress through integration with banks and government agencies, but traditional SMEs lack access to advanced digital tools. In the informal sector, programmes such as iSpace and Hopin Academy have tried to improve digital literacy, but challenges remain.

2. Main structural barriers: Limited access to finance was identified as the main barrier to SME digitisation, with many companies unable to access credit or venture capital. In addition, digital infrastructure remains insufficient, with high connectivity costs and deficiencies in internet coverage in rural areas. The lack of training aligned with the needs of the digital labour market, poor coordination between the public and private sector and the absence of fiscal incentives have been identified as important constraints.
3. Lack of inter-institutional coordination: The fragmentation of the digital ecosystem has been a constant feature of the meetings. The absence of a joint strategy between government, innovation hubs and private companies generates duplication of efforts and limits the effectiveness of initiatives. The creation of a National Digital Cluster was proposed to optimise investment in digitalisation, foster collaboration between actors and improve the implementation of technology policies.
4. Potential of emerging technologies: Artificial intelligence, cybersecurity and blockchain have been mentioned as areas of great potential, but adoption remains low due to lack of training and funding. Some initiatives, such as the Ghana Telecom University College and IoT Network Hub, are integrating these technologies into their programmes, but more effort is needed to scale up their impact on SMEs and startups.
5. Gaps in training and digital talent: Training in digital skills is not aligned with market demands. Although programmes such as Soronko Academy and PAMEPI Women in Tech exist to improve the employability of women in technology, the brain drain to foreign companies and the lack of advanced training in AI and cybersecurity remain major challenges. The development of accessible digital training platforms in local languages has been proposed to expand coverage.
6. International collaboration opportunities: There is high interest in collaborating with international entities to strengthen digitisation in Ghana. Knowledge exchange opportunities were identified with hub networks in Kenya and cooperation models with the Canary Islands. Programmes such as the Ghana Digital Acceleration Project, funded by the World Bank, could be an avenue for channelling external support for training and access to technology.
7. Gender impact on digitalisation: The gender gap in technology remains a challenge, but strategies have been implemented to improve women's participation in the digital sector. Initiatives such as Phaba in Tech and

Soronko Academy programmes have shown that specialized training and access to mentoring networks can increase female inclusion in the digital ecosystem.

8. Digital commerce and digitisation of traditional sectors: E-commerce is growing in Ghana, but faces barriers such as consumer distrust and lack of digital payment culture. Initiatives such as Hopin Academy's Danni platform aim to facilitate the digitisation of entrepreneurs in sectors such as agritech, health and logistics.

In summary, Ghana has made progress in digitising its entrepreneurial ecosystem, but structural barriers remain, such as access to finance, the rural-urban digital divide, lack of inter-agency coordination and poor training in emerging technologies. The feedback from these meetings reinforces the need for an integrated digital strategy that prioritises access to finance, training in key digital skills and the creation of a more coordinated and sustainable ecosystem.

Next steps should include strengthening public-private sector dialogue, implementing accessible training programmes, promoting tax incentives for SME digitisation and seeking international funding to boost Ghana's digital ecosystem.

8.2. Surveys conducted

In order to assess in depth the digital training needs and employability conditions in Ghana's technology sector, a questionnaire was designed for companies, associations, NGOs and public entities with relevant activity in the country's digital ecosystem. With a total of 32 valid responses, this exercise made it possible to identify the most in-demand skills, the main mismatches between skills supply and demand, the preferred training methodologies and the most common barriers in training processes.

The details of the questionnaire are included in the annexes, while the most relevant results of the study are analysed below:

1. Prevalence of basic digital skills

A significant part of the organizations indicate that their employees possess digital skills at a basic level. This is evidence of a workforce still in the initial stages of technological appropriation, which limits the ability of companies to adapt to an increasingly digitalized environment.

2. Lack of market-driven training

Although some companies have offered digital training to their teams, most have not done so in the last year. This is due to both a lack of resources and a lack of relevant programmes. Organizations agree that the training available does not respond to the real needs of the productive sector.

3. Critical gap between demand and supply of technological skills

The skills most in demand today - data analysis, programming, cybersecurity and automation - do not correspond to the real skills of the workers available in the market. This gap is directly affecting the competitiveness and growth of the technology sector.

4. Practice- and job-oriented digital training

Companies demand practical training, focused on real cases, with applied technical modules and direct connection to job opportunities. The possibility of work placements, internships or apprenticeships in real working environments is particularly valued.

5. Cost, time and infrastructure: the main barriers

Barriers to training are recurrent: high cost, lack of time for employees to train and poor technological infrastructure to deliver quality courses, especially in regions outside Accra and Kumasi.

6. Face-to-face training still preferred, but hybrid model emerging

Although face-to-face training is still the most valued by companies, many recognize the usefulness of online or hybrid formats, especially if they allow for flexible hours and access from areas with less physical connectivity.

7. Real difficulties in finding qualified technology profiles

Organizations report specific difficulties recruiting specialised profiles, such as software developers, data analysts, and IT security experts.

In some cases, they do not even manage to clearly define the profiles they need, reflecting a lack of maturity in the human resources selection and planning processes.

8. The education and business ecosystem still operate in a disconnected manner

A widespread concern is the poor relationship between training institutions and the productive fabric. Businesses propose strengthening collaboration between universities, technical training centers and the private sector to align curricula with the skills that the market actually demands.

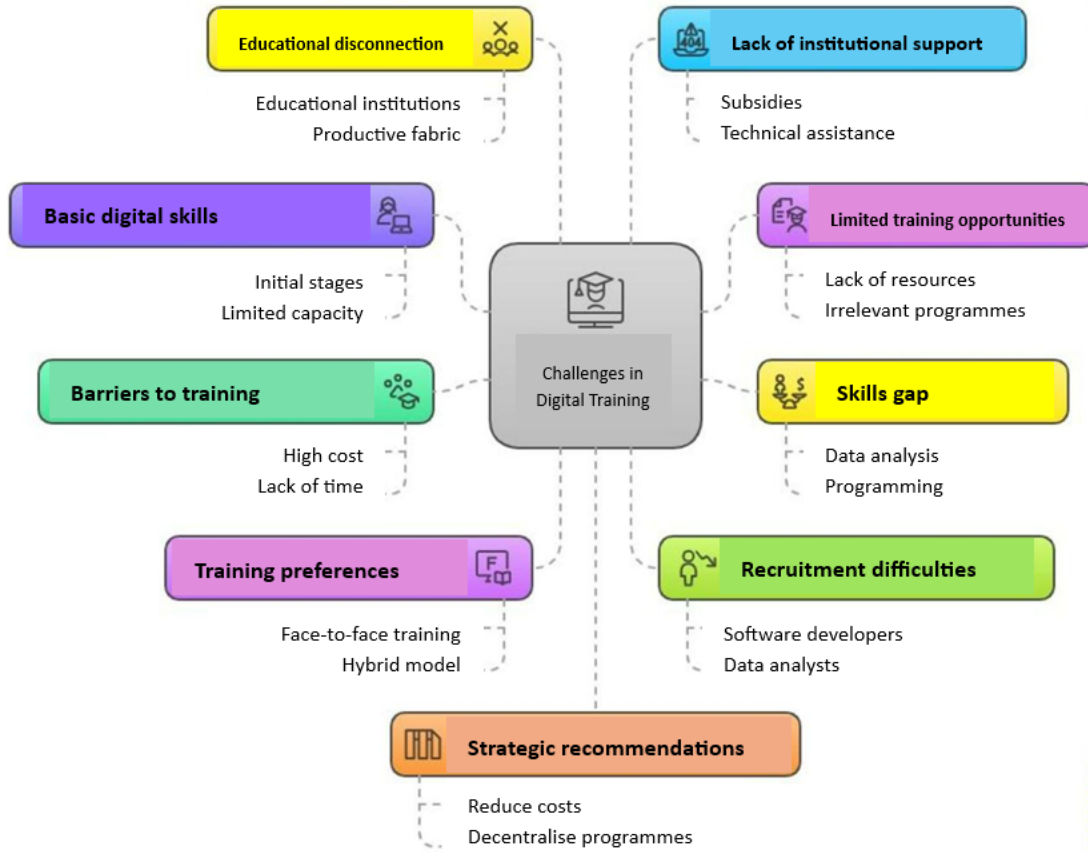
G. Lack of accessible and effective institutional support

Only a minority of organizations have received some kind of institutional support (grants, technical assistance or training programmes). Many enterprises express ignorance of these programmes or consider that they are designed for large actors, leaving out micro and small enterprises.

10. Practical and clear strategic recommendations

The organizations surveyed propose specific measures to overcome the barriers detected: reducing the cost of digital training, decentralizing educational programmes, promoting content in local languages, improving the connection with educational centers, and offering incentives to companies that invest in technological training. These actions, according to the participants, are key for digital training to become a real driver of employability and economic development.

Challenges and strategies in training and employability in Ghana



Main findings of the surveys carried out in Ghana. Own elaboration

Finding 1: Expansion of digital access in Ghana

Ghana has made significant progress in expanding its digital infrastructure, driving growth in mobile network coverage and internet access. Currently, 4G coverage has reached a considerable presence in major cities and continues to expand into peri-urban and rural areas. In addition, the country is advancing in strategic planning for the implementation of 5G networks, with the aim of improving data speed, stability and transmission capacity, facilitating access to advanced digital services.

Despite this progress, challenges remain related to affordability and coverage in rural areas, where connectivity remains limited and internet access costs can be prohibitive for many SMEs and entrepreneurs. The expansion of fibre optic networks and the strengthening of telecommunications infrastructure in less developed areas are critical to ensure inclusive digitisation.

To maximize the impact of this digital expansion, it is key to promote policies that encourage competition in the telecommunications sector, reduce the cost of internet access and promote innovative connectivity models in rural areas, such as community networks or the use of satellite technologies. These improvements would enable not only greater digital inclusion of businesses, but also equitable access to educational opportunities, commerce and digital services across the country.

Finding 2: Strengthening digital skills

Ghana has launched a number of initiatives to improve digital literacy, recognizing the importance of technology skills in an increasingly digitized business environment. Government programmes, partnerships with academic institutions and private sector associations have enabled the training of thousands of people in basic digital skills and the use of essential technology tools for business management. However, there are still significant gaps in training in key areas such as cybersecurity, artificial intelligence, big data, process automation and digital commerce, which are increasingly in demand by the labour market and by companies seeking to strengthen their competitiveness.

To expand the impact of digital skills in the country, it is essential to develop more specialised training programmes tailored to the needs of Ghana's productive fabric. These programmes should focus on improving the capacity of SMEs to integrate digital solutions into their operations, ensure the security of their online transactions, and leverage data analytics for strategic decision-making.

In addition, there is a need to promote flexible learning methods, including online training platforms, international certifications and dual training schemes that combine theory and practice in real business environments.

Another key aspect is collaboration with international actors for the development of curricula aligned with global trends in digital transformation. Partnerships with universities, technology centers and companies in the ICT sector can enable the creation of innovative training programmes in cybersecurity and data analytics, ensuring that Ghanaian digital talent has a competitive profile regionally and internationally.

Strengthening digital skills will not only benefit established businesses, but will also help boost tech entrepreneurship, facilitating the creation of startups based on digital solutions and promoting job creation in strategic sectors such as fintech, online education and artificial intelligence applied to industry. To ensure the success of these initiatives, it will be key to ensure equitable access to training across the country, paying special attention to rural communities and the most vulnerable sectors, thus reducing the digital divide and promoting a more inclusive and sustainable digital transformation.

Finding 3: Boosting the digital transformation of SMEs

The process of digitisation of SMEs in Ghana has advanced in recent years, especially in sectors such as trade and financial services, where the adoption of digital tools has led to improved efficiency and access to new markets. However, digitisation remains partial and faces barriers that limit its expansion, especially in small businesses that still operate with traditional methods of management and marketing.

Although some SMEs have integrated basic tools such as social media for marketing and messaging applications for customer communication, the use of advanced business software remains low, with many companies lacking access to integrated management systems (ERP), e-commerce platforms or digital solutions for accounting and e-invoicing. Lack of awareness of the benefits of these tools, coupled with the costs associated with their implementation, has slowed their adoption in many sectors.

To accelerate the digital transformation of SMEs, the implementation of specific incentives, such as subsidies or preferential financing schemes for the adoption of business software, is required. In addition, there is a need to strengthen training programmes geared towards digital business management, ensuring that entrepreneurs and small business owners understand the value of digitalization and know how to apply it effectively in their operations.

E-commerce is another key area with great potential for expansion. Despite the growth of platforms such as Jumia and Tonaton, 60% of SMEs still rely on social media and traditional sales methods. This suggests the need for support programmes to integrate more companies into formal e-commerce platforms, facilitating their access to national and international markets. Simplification of registration processes and optimisation of logistics systems can also contribute to greater adoption of e-commerce.

In addition, the digital transformation of SMEs should be supported by increased confidence in electronic payments. Currently, 85% of online transactions in Ghana are still cash on delivery, reflecting a lack of trust in digital payment systems and the need to improve financial literacy in this area. Boosting the use of trusted and secure fintech solutions, such as MTN MoMo and Vodafone Cash, could facilitate the adoption of digital payments and reduce reliance on cash, making transactions more efficient and secure.

For these initiatives to succeed, it is crucial that digitisation policies are tailored to the needs of each sector and that technological solutions are accessible both in terms of cost and ease of use. In addition, collaboration with private sector actors and international organisations can facilitate Ghanaian SMEs' access to cutting-edge technology and internationalisation opportunities, thus boosting their competitiveness in the global digital economy.

Finding 4: Development of the entrepreneurial ecosystem

Ghana has experienced remarkable growth in its entrepreneurial ecosystem, with an increase in the number of tech startups that are driving innovative solutions in sectors such as fintech, digital commerce, health, education and agribusiness. The combination of a young population, growing access to mobile devices and the expansion of digital financial services has created an environment conducive to the emergence of new technology-based business models. However, for these startups to scale and consolidate in the market, it is essential to strengthen their access to collaborative networks, accelerate their development and facilitate their integration into international markets.

Despite the dynamism of the Ghanaian entrepreneurial ecosystem, many startups still face significant challenges, especially in terms of access to funding, specialized mentoring and international expansion opportunities. A lack of early-stage investment and a dearth of networks with global investors limit the ability of many startups to scale their operations and compete in a globalised digital environment.

To address these challenges, it is key to strengthen the linkage of Ghanaian entrepreneurs with acceleration and incubation programmes that offer technical support, strategic advice and connections to international markets.

One of the most effective strategies to strengthen the entrepreneurial ecosystem in Ghana is the creation of international collaborative networks. Linking with innovation hubs and accelerators in other markets can facilitate knowledge sharing, open up new funding opportunities and allow startups to access mentoring from experts in digital transformation and technology business scalability. Soft-landing programmes in European or African markets, in collaboration with international incubators, can facilitate the internationalisation of Ghanaian startups with high growth potential.

In addition, Ghanaian startups should be encouraged to participate in global technology forums and events, where they can present their solutions, establish strategic alliances and attract investors. Currently, participation in these spaces remains limited due to funding constraints and the lack of visibility of many startups in international markets. Initiatives such as facilitating business missions and co-organising technology events in Ghana with international players can significantly contribute to the exposure of Ghana's digital ventures.

On the other hand, strengthening investment and funding mechanisms for startups is critical to ensure the sustainability of the entrepreneurial ecosystem. Despite the growth of fintech services in Ghana, access to venture capital remains limited, and many startups rely on traditional funding sources that are not always suited to the nature of technology entrepreneurship. Promoting alternative funding models, such as specialised technology investment funds, co-investment programmes with multilateral agencies or the promotion of digital crowdfunding, could help diversify funding options for emerging startups.

Finally, to strengthen the entrepreneurial ecosystem in Ghana, it is crucial that the public and private sector work together to create a regulatory environment conducive to digital innovation. This includes simplifying procedures for the creation of technology companies, developing tax incentives for startups, and implementing policies that encourage intellectual property protection and investment in technology.

In short, Ghana has a growing entrepreneurial ecosystem, but its consolidation requires a comprehensive approach that combines access to finance, strengthening of international networks, participation in accelerator programmes and an enabling regulatory environment. The country has the potential to become a leader in technological innovation in West Africa if it can connect its entrepreneurial talent with global opportunities and consolidate a supportive environment for the scalability of digital start-ups.

Finding 5: Modernisation of strategic sectors

Ghana has key sectors such as agribusiness, logistics and manufacturing, which represent key pillars of its economy and employ a significant part of the population. However, digitalisation in these sectors remains limited, which hinders the optimisation of production processes, the reduction of operating costs and the improvement of the competitiveness of the companies that make up these sectors. The incorporation of digital technologies in these areas would increase efficiency, improve product traceability and facilitate the integration of companies into international value chains.

In agribusiness, digitisation can have a significant impact on productivity and on the sector's resilience to climate and market challenges. Despite technological initiatives in this area, such as the farm advisory platforms Esoko and Farmerline, many farms still rely on traditional production and marketing methods. The implementation of crop monitoring solutions using IoT sensors, drones and real-time data analytics would enable farmers to improve irrigation management, fertilisation and early detection of pests and diseases.

In addition, the adoption of digital traceability platforms can improve the quality and safety of agricultural products, facilitating their access to international markets. Tools that record production, storage and distribution data would enable farmers to meet export standards and reduce losses in the supply chain. To encourage the digitisation of the sector, it is essential to offer training programmes and accessible financing to enable small and medium-sized producers to access technologies that were previously reserved for large farms.

In the logistics and transport sector, digitisation represents a key opportunity to improve operational efficiency and reduce costs. Ghana faces challenges in optimising its supply chain, where the lack of automation in inventory management and product distribution leads to delays and cost overruns. The implementation of digitised logistics systems, such as warehouse management software (WMS), fleet tracking platforms and route optimisation solutions, would enable companies to reduce delivery times and improve the profitability of their operations.

E-commerce in Ghana continues to expand, but its growth is conditioned by the ability of logistics companies to provide fast, reliable and real-time tracked deliveries. The adoption of last-mile tools and the integration of digital payment systems into the distribution chain would improve the customer experience and strengthen trust in digital commerce.

Similarly, modernisation of the logistics sector would facilitate the export of Ghanaian products, allowing for better integration into international trade and increased competitiveness in the global market.

For these improvements in agribusiness and logistics to materialise, both the public and private sectors need to promote policies that encourage the adoption of technology in these strategic sectors. It is recommended that partnerships between technology companies and actors in the agri-food and logistics sector be promoted to facilitate the transfer of knowledge and the development of solutions adapted to the needs of the Ghanaian market.

In conclusion, the modernisation of strategic sectors such as agribusiness and logistics is essential to ensure sustainable and inclusive growth in Ghana. The incorporation of digital technologies will improve productivity, optimise the supply chain and facilitate integration into international markets. The key to achieving this transformation lies in access to affordable technologies, training in digital skills and the implementation of innovative solutions adapted to the country's realities.

Finding 6: Increased international cooperation

Ghana has shown increasing interest in strengthening its collaboration with international actors to drive the digital transformation of its economy. Digitalisation is a key pillar in the country's development strategies, and cooperation with foreign institutions can facilitate access to new technologies, funding, specialised training and best practices in the digital domain. The experience of other regions in technological modernisation processes can serve as a reference to design effective strategies that are adapted to the specific needs of the Ghanaian business ecosystem.

Collaboration with academic institutions and technology centres has been a key mechanism for improving digital skills in Ghana. However, there is still room to expand these initiatives and strengthen knowledge transfer in areas such as cybersecurity, artificial intelligence, big data and digital business transformation.

Linking up with foreign universities and organisations specialising in technology training would improve the educational offer in the country and ensure that Ghana's digital talent has skills aligned with the needs of the global market.

On the business side, international cooperation can facilitate the access of Ghanaian SMEs and startups to new markets and investment opportunities. The creation of joint programmes with foreign accelerators and investment funds would allow the country's digital entrepreneurs to scale their projects and connect with global technology ecosystems. Strengthening collaborative networks with

innovation hubs in Europe and other African regions would facilitate knowledge exchange, the development of joint solutions, and the opening of business opportunities.

9.2. Suggestions for the implementation of programmes and Canary Islands-Ghana collaboration

Given the Canary Islands' experience in the development of digital transformation strategies, ICT training and support for the internationalisation of companies, there are several opportunities to strengthen collaboration with Ghana in key areas. To maximise impact, these initiatives should be structured in sustainable programmes adapted to the particularities of the Ghanaian digital ecosystem.

Programme 1: Creation of an advanced digital skills training programme

It is recommended that a joint ICT training programme be designed, aimed at improving the employability and digital competitiveness of Ghanaian professionals. This programme could include:

- Specialised courses in cybersecurity, big data, artificial intelligence and e-commerce, delivered in hybrid format (face-to-face and online).
- Alliances with universities and technology centers in the Canary Islands to award internationally recognised certifications.
- Training adapted to the needs of SMEs, including digital business management and online marketing strategies.

Programme 2: connection between entrepreneurial ecosystems and startup acceleration.

Given the growth of digital entrepreneurship in Ghana, the Canary Islands can serve as a platform for the internationalisation of technology startups through:

- Linking Ghanaian incubators and accelerators with innovation networks in the Canary Islands, facilitating mentoring and access to funding.
- Organising exchange programmes where Ghanaian entrepreneurs can participate in investment forums, business missions and networking events in the Canary Islands.
- The creation of a Canary Islands-Ghana innovation hub, allowing technology companies from both territories to collaborate in the development of scalable digital solutions.

Programme 3: Strengthening the digitisation of trade and access to international markets

Digital trade in Ghana has grown, but many SMEs still rely on traditional sales systems. To enhance their integration into international markets, it is recommended to:

- Develop training programmes in e-commerce platform management and digital payment optimisation.
- Create advisory spaces for the adaptation of Ghanaian products to international norms and standards, facilitating their export.
- Support the digitisation of logistics processes, promoting the adoption of digital management tools for distribution and inventory control.

Programme 4: Implementation of digital solutions in strategic sectors

Opportunities exist to apply technology in key sectors of the Ghanaian economy. Some lines of action include:

- Digitalisation of agribusiness: implementing technological solutions for the optimisation of agricultural production, including crop monitoring with IoT sensors and digital traceability platforms.
- Modernisation of the logistics sector: promoting the adoption of supply chain and distribution management technologies, improving the efficiency of freight transport.
- Expansion of fintech platforms: support the consolidation of digital financial services that facilitate the financial inclusion of small producers and entrepreneurs.

Programme 5: Strengthening the institutional cooperation framework

To ensure the sustainability of joint initiatives, it is recommended:

- Establish bilateral agreements between the Canary Islands and Ghana for cooperation in digital transformation, fostering the exchange of knowledge and best practices.
- Create a digitalisation observatory, with the participation of entities from both territories, to monitor progress and detect new opportunities for collaboration.
- Promote Ghana's participation in European programmes to support digitalisation in Africa, taking advantage of the Canary Islands' experience in the management of international funds.

Cooperation between Ghana and the Canary Islands has significant strategic potential, based on geographical, economic and digital development factors that can translate into a mutually beneficial partnership. Both regions have complementary opportunities that can foster the growth of their respective technological and business ecosystems through a fluid exchange of knowledge, specialised training and innovative solutions.

From a geographical perspective, the Canary Islands is in a privileged position as a platform connecting Europe and West Africa, facilitating the entry of companies, technology and specialised training into the Ghanaian market. The Canary Islands' experience in digital transformation, internationalisation of companies and training in technological skills positions it as a strategic partner for strengthening the digital ecosystem in Ghana.

For its part, Ghana represents a market with great potential for expansion, being one of the fastest growing economies in Africa. Its dynamism in sectors such as fintech, e-commerce and technological solutions for agribusiness and logistics opens up opportunities for Canary Islands companies with experience in these areas to explore business partnerships, knowledge transfer and joint development of innovation projects. In addition, Ghana is consolidating its position as a technological and financial hub in West Africa, with a growing entrepreneurial ecosystem and favourable policies for digitalisation.

Another key factor in this relationship is connectivity and ease of cooperation. Ghana and the Canary Islands share a similar time zone, which facilitates the management of joint projects, business communication and the development of distance learning initiatives. In addition, the growing presence of Ghanaian companies and institutions with an interest in international collaboration favors the structuring of cooperation programmes in areas such as digital skills training, SME digitalization, and strengthening the innovation and entrepreneurship ecosystem.

At the cultural level, there is a tradition of collaboration in education, business and trade between Spain and West Africa, which provides a favourable basis for the development of long-term sustainable partnerships. This relationship can be translated into joint training programmes, incubation of start-ups, access to investment networks and promotion of technologies adapted to the needs of the Ghanaian market.

In short, cooperation between the Canary Islands and Ghana has the potential to become a model for strategic collaboration in digital transformation and business development in West Africa. Taking advantage of the strengths of each region will generate a positive impact in terms of digital inclusion, talent training, modernisation of strategic sectors and access to new markets, consolidating the Canary Islands as a preferential partner in the promotion of digitalisation and technological entrepreneurship in Ghana.

10. Annexes

10.1. Details of the questionnaire

Section 1: General information about the organisation

1. Name of organisation * Type of organisation * Type of organisation
2. Type of organisation
 - Private company
 - Professional organisation
 - Public body
 - NGO
 - Other
3. Size of organisation (number of employees) * Less than 10
 - Less than 10
 - 10-50
 - 51-100
 - More than 100
4. Main sector of activity *
 - Trade
 - Services
 - Manufacturing
 - Information technology
 - Other

Section 2: Status of digitisation in the organisation

5. Which digital technologies does your organisation currently use? (Check all that apply) * (Check all that apply)
 - Core office technologies
 - Cloud computing
 - Process automation tools

- Big Data and data analytics
 - Artificial intelligence
 - E-commerce
 - Digital marketing
 - Other
6. What is the level of technology adoption in your organisation? *
- Low (we use basic technologies)
 - Medium (we have implemented some technological solutions)
 - High (our organisation is highly digitised)
7. What are the main barriers your organisation faces in moving towards digitisation (tick all that apply)?
- Lack of technological infrastructure
 - High costs
 - Lack of qualified personnel
 - Lack of information on available technologies
 - Lack of awareness of the benefits
 - Other
8. Which digital tools or services do you consider most important for your organisation in the next two years? *

Section 3: Digital training needs

9. What is the current level of digital skills of your employees? *
- Basic
 - Intermediate
 - Advanced
10. Has your organisation provided digital skills training to your employees in the last 12 months? *
- Yes
 - No
11. If yes, what type of training has been provided? (Please tick all that apply)
- Basic office skills
 - Digital marketing
 - Cybersecurity

- Use of automation tools
- Programming or software development
- Other

12. What digital skills do you see as priorities for your organisation in the next two years?

- Data management
- Software development
- Artificial intelligence
- Process automation
- Digital marketing
- E-commerce
- Other

13. What is your organisation's preferred training modality? *

- Face-to-face
- On-line
- Blended

14. What are the main difficulties in training your employees in e-skills? (Tick all that apply) * Lack of time

- Lack of time
- Cost of training
- Lack of suitable training providers
- Lack of adequate technological infrastructure
- Other

Section 4: Employability and skills gap

15. In your sector, which technological skills are currently most in demand? *

- Programming and development
- Data analysis
- Technology project management
- IT security
- Other

16. Do you think that the training of technology workers in Ghana is sufficient to meet the needs of your sector? *

- Yes
- No
- Don't know

17. Are there significant skills gaps in your sector? If yes, which ones?
Which ones? *

18. What are the most difficult technology profiles to recruit in your
organisation? *

19. What actions do you consider necessary to improve employability in the
technology sector in Ghana (tick all that apply)?

- Improve the training offer
- Strengthen the collaboration between educational institutions and
companies
- Create more government incentives for technology training
- Facilitate access to technological resources
- Other

Section 5: Support policies and programmes

20. Has your organisation received support from governmental or non-
governmental programmes to improve its technological capabilities? *

- Yes
- No

21. If yes, what type of support have you received (check all that apply)?

- Grants or funding
- Access to technology infrastructure
- Training programmes for employees
- Technical assistance
- Other

22. What types of support programmes do you think are most needed to
improve employability and digital skills in Ghana? *

Section 6: Conclusion

23. What recommendations would you make to improve digital skills in your
country? *

24. What measures could improve the employability of tech workers in your
sector? *

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- CIA: Central Intelligence Agency.
- CIS: Commonwealth of Independent States.
- CEL: Centre for Enterprise Leadership.
- CMS: Content Management System.
- CNAE: National Classification of Economic Activities.
- COTVET: Council for Technical and Vocational Education and Training.
- COVID: Coronavirus Disease
- CRM: Customer Relationship Management
- CSA: Cyber Security Authority
- CSIR: Council for Scientific and Industrial Research
- DANIDA: Danish International Development Agency
- DBG: Development Bank Ghana
- DISS: Digital Innovation Support Scheme
- DPC: Data Protection Commission
- DSM: Digital Single Market
- DTEG: Digital Transformation for Inclusive Entrepreneurship in Ghana
- EB: Exabyte
- EE: Education and Employment
- EHR: Electronic Health Record
- ENRICH: Enhancing Innovation Capacity in Africa
- ERP: Enterprise Resource Planning
- EU: European Union
- FAO: Food and Agriculture Organisation of the UN
- ERDF: European Regional Development Fund
- FEMETE: Federation of Metal and New Technologies Companies of Tenerife.
- GCYE: Ghana Chamber of Young Entrepreneurs
- GEA: Ghana Employers' Association
- GHN: Global Hubs Network
- GHS: Ghana Cedi
- GIFEC: Ghana Investment Fund for Electronic Communications GHS: Ghanaian Cedi



- NITA: National Information Technology Agency
- OECD: Organisation for Economic Co-operation and Development OICG: Opportunities for Industrial Collaboration in Ghana
- OICG: Opportunities for Industrial Collaboration in Ghana
- NGO: Non-Governmental Organisation
- UN: United Nations
- PAMEPI : Paabinaa Meriga Peace Initiative
- PHP: Hypertext Preprocessor
- GDP: Gross Domestic Product
- UNDP : United Nations Development Programme
- RISA: Research and Innovation Systems for Africa
- CSR: Corporate Social Responsibility
- RVO: Rijksdienst voor Ondernemend Nederland
- SEM: Search Engine Marketing
- SEO: Search Engine Optimization
- STEM: Science, Technology, Engineering and Mathematics
- STEPRI: Science and Technology Policy Research Institute
- STI: Science, Technology and Innovation
- TOR: Topic of Reference
- TVET: Technical and Vocational Education and Training
- AU: African Union
- UAE: United Arab Emirates
- EU: European Union
- ITU: International Telecommunication Union
- UK: United Kingdom
- ULL: University of La Laguna
- ULPGC: University of Las Palmas de Gran Canaria
- UN ITU: United Nations International Telecommunication Union
- UNESCO: United Nations Educational, Scientific and Cultural Organisation
- UNFPA: United Nations Population Fund
- UNICEF: United Nations Children's Fund
- USAID: United States Agency for International Development
- USD: United States dollar

- USSD: Unstructured Supplementary Service Data
- UU: Universal Units
- VCTF: Venture Capital Trust Fund
- WCEA: World Continuing Education Alliance
- WMS: Warehouse Management System