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Africa Developer Ecosystem 2021

Creating opportunities and building for the future

Contents

Africa Developer Ecosystem
2021

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Foreword

Every day, African businesses are harnessing ingenuity to empower their communities. We believe there's no one better to solve local challenges than Africa's developers, founders, and entrepreneurs. For the second year in a row, Google commissioned Accenture to produce analysis that resulted in this report to map Africa's developer landscape. We expanded this edition of the report to include YoY growth analysis, tech ecosystem components, and key growth factors. The research was conducted in 16 markets and the findings were extrapolated to the rest of African countries.

In 2021, COVID-19 continued to shape the opportunities and challenges facing developers and the tech community in Africa. The developer population rose by 3.8% in 2021 — and average income per developer rose as well — despite the contraction of the global economy. Three main factors across the tech ecosystem contributed to this positive trend: Local startups, which hire over half of African developers, raised over $4bn in 2021, 2.5x times more than in 2020. Increased global demand for remote tech talent, which was accelerated by the pandemic, created more remote employment opportunities for African developers.

Finally, local businesses increased their use of the internet and hired developers to help them grow their businesses online.

More African developers are getting full-time jobs due to both the rise in demand from local startups, and the global demand for remote technical talent. Nigeria's professional developer population had the largest magnitude growth of any African country during this time, with an estimated 5,000 new professional software developers in 2021.

Our research also found that women developers, learners, and junior developers would benefit from better infrastructure and more educational opportunities. To continue growth, technology companies, educators and governments are tackling local challenges through innovative partnerships and programs. Google is committed to supporting developers at each stage of their journey through regional developer training, community, and mentorship programs.

Key takeaways

Developer population and average pay increases

The pool of professional developers **increased by 3.8%** to account for 0.4% of the continent's non-agricultural workforce. Average software developer **salaries and compensation increased**, and more developers secured full-time jobs. African developers are, on average, **younger than in more mature markets**. They **work primarily in Android and web app** development.

Demand for African developers reaches new heights

African startups, which are responsible for hiring more than half of local developers, **raised more than $4 billion in 2021** — 2.5x times more than they raised in 2020. With 22% of **sub-Saharan SMBs starting or increasing their use of the internet**, the need for web development services increased. **Higher demand for remote development work** also led to increased opportunities; 38% of African developers work for at least one company based outside of the continent.

Education and access will drive growth

Global technology companies, local educators, and governments are **strengthening the developer pipeline by investing in both internet access and education.** Junior and emerging talent, as well as under-supported groups including women, **need vocational training and affordable internet access** to benefit from broader progress. Tech companies are making headway through local partnerships.

Research and reporting methodology

Read more about our process in the appendix

1600

Software developers surveyed

25

Local experts interviewed

20+

External data sources consulted

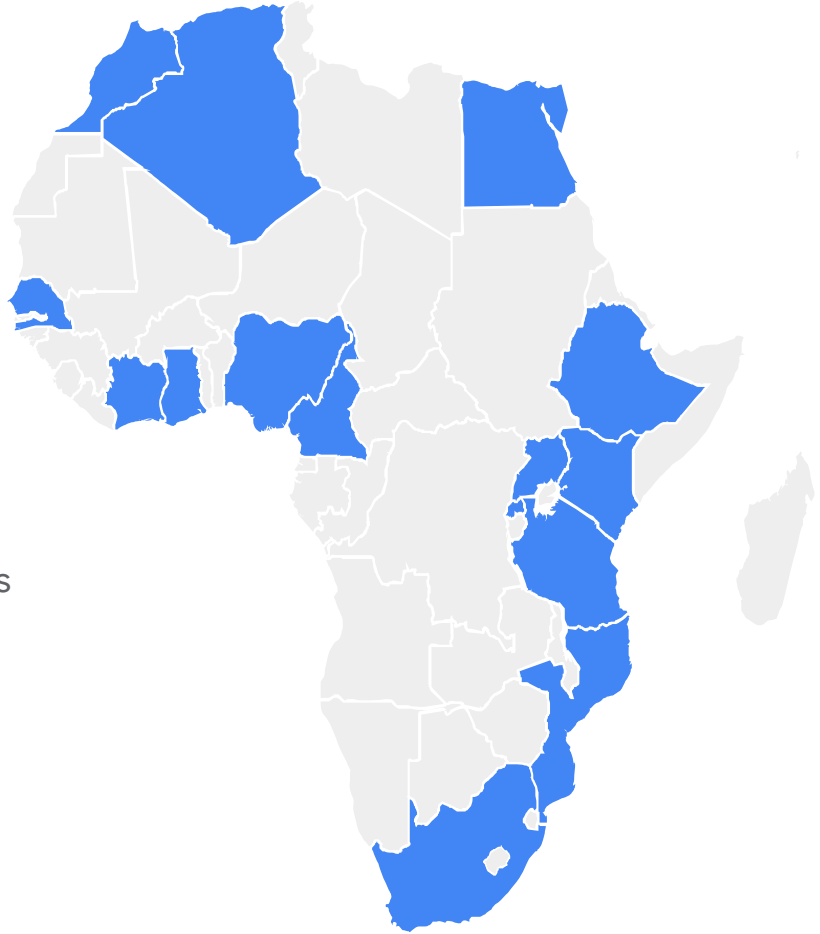
16

Markets modeled across the developer population

This report includes **16 countries** across the African continent:

Algeria, Cameroon, Egypt, Ethiopia, Ghana, Ivory Coast, Kenya, Morocco, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Tunisia, Uganda

Direct research on the software developer population size was conducted in 16 markets and the findings were extrapolated to the rest of African countries.



Four factors influence the growth trajectory of a country's developer population

01.

Macro-Economic Landscape

Overall economic prosperity and growth, urbanization and accessibility to electricity and key inputs

02.

Government Support

Governance and regulatory support of business landscape, and ease of starting and doing business

03.

Technology Ecosystem

Technology readiness, internet penetration and affordability, developer communities and training, technology hubs, startup ecosystem and funding

04.

Developer Population Indicators

Software developer population (2020), software spend, users on leading developer platforms, education quality and prevalence of advanced technologies, including artificial intelligence and machine learning

We categorized 16 African countries into five trajectories for this report

Developer Landscape Trajectory Categories	Countries
Maintaining ***Preserving steady growth*** Largest developer population, investment in leading technologies, strong education, and robust startup and technology ecosystem dominated by larger companies	South Africa
Advancing ***Sprinting ahead as fast followers*** Large developer population, strong startup ecosystem with a strong funding environment, and stable socio-economic conditions	Egypt, Nigeria, Kenya
Cultivating ***Fostering landscape for growth*** Moderate-to-large developer population, mid-late-stage startup and technology ecosystem, and moderately stable economic environment	Morocco, Rwanda, Ghana
Emerging ***Establishing the foundation for growth*** Small-to-moderate developer population, early-stage startup ecosystem, and an improving technology ecosystem	Tunisia, Algeria, Ivory Coast, Senegal
Nascent ***Tackling challenges to enable growth*** Small developer population, early-stage startup ecosystem, and basic technology and low-to-moderately stable economic environment	Ethiopia, Cameroon, Uganda, Tanzania, Mozambique

Developer population and average pay increases

9.

Developer population and pay increases

Across the continent, the pool of professional developers increased by **3.8% YoY**

3.8%

Total number of developers

716k

The 2021 growth rate varied from country to country across all growth stages

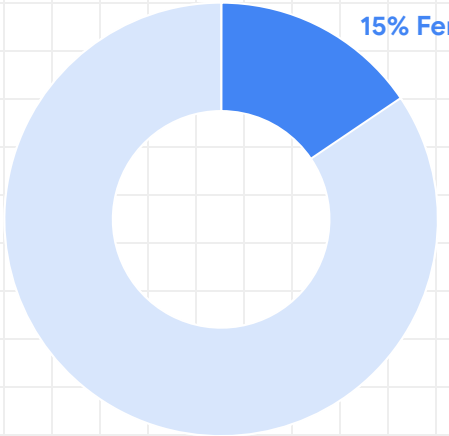
Country	Professional Developers (2020)	Magnitude Change	% Change	Professional Developers (2021)	% of Non-Ag. Workforce	% Total of Africa
South Africa	119K	**+2K**	2.0%	121K	1.4%	17%
Egypt	87K	**+2K**	2.5%	89K	0.6%	12%
Nigeria	84K	**+5K**	6.0%	89K	0.3%	12%
Kenya	58K	**+2K**	3.0%	60K	0.6%	8%
Morocco	47K	**+3K**	6.0%	50K	1.0%	7%
Ghana	18K	**-**	2.0%	18K	0.2%	2%
Rwanda	4K	**-**	-3.0%	4K	0.2%	1%
Ivory Coast	9K	**-**	1.0%	9K	0.2%	1%
Tunisia	21K	**+2K**	7.5%	23K	1.1%	3%
Senegal	9K	**+1K**	6.5%	10K	0.4%	1%
Algeria	28K	**+1K**	4.0%	29K	0.4%	4%
Tanzania	15K	**-**	2.0%	15K	0.2%	2%
Ethiopia	18K	**+1K**	6.0%	19K	0.1%	3%
Uganda	11K	**-**	-1.0%	11K	0.3%	2%
Cameroon	20K	**+1K**	4.0%	21K	0.4%	3%
Mozambique	6K	**+1K**	10.0%	7K	0.2%	1%
Rest of Africa	136K	**+5K**	4.0%	141K	0.2%	20%
Africa Total	**690K**	**26K**	**3.8%**	**716K**	**0.4%**	**100%**

Sources: Accenture Analysis
Note: Professional developers rounded to the nearest thousand to better illustrate degree of change YoY – April 2020 to October 2021; % change rounded to the nearest 0.5%

The majority of African developers are men. The average local developer is seven years younger than their global counterpart and has up to three years of experience.

Gender Profile

N=1600[1]

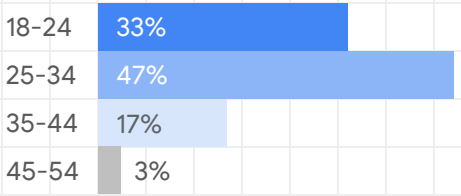


Age Profile

N=1598*

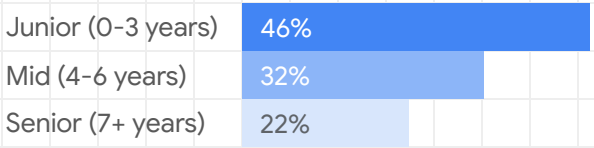
80% of developers are < 35 years old

Avg. African developer is **29 years old vs. 36 global average**[2]



Professional Seniority Level

N=1300, only includes professional developers

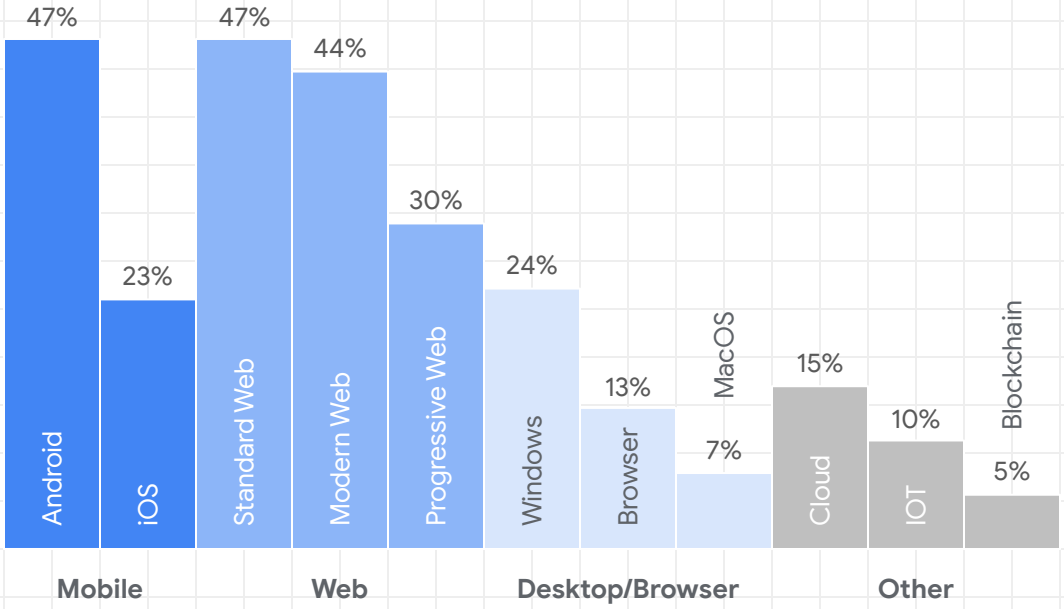


Sources: 1. Accenture African Software Developer Survey fielded 9/27/21-10/22/21, 2. Stack Overflow Developer Survey 2020 and 2021

African developers have strong programming experience in both web and mobile. One in two developers builds apps for Android.

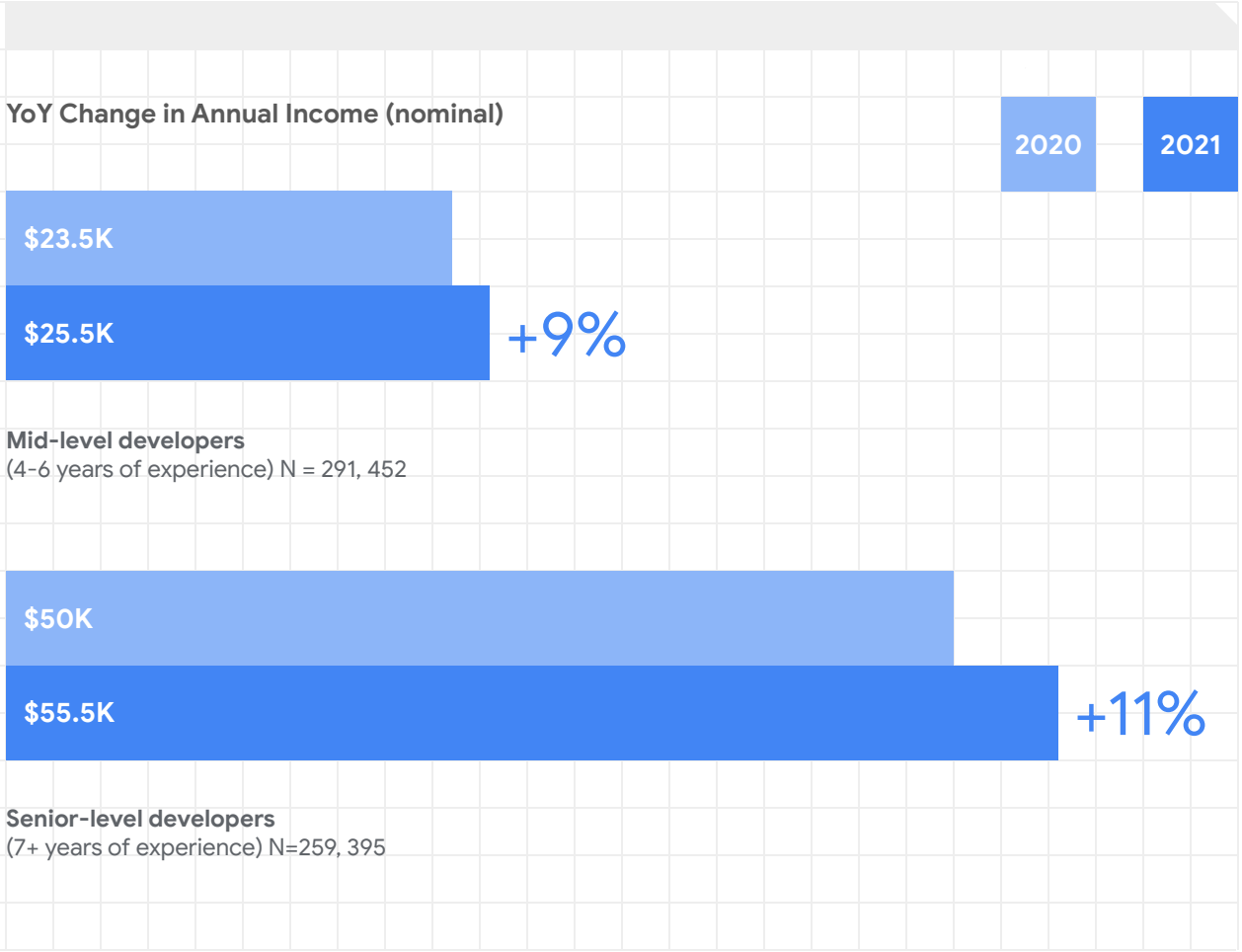
Platforms published on[1]
N=1600

Note: Average respondent selected 1.7 platforms



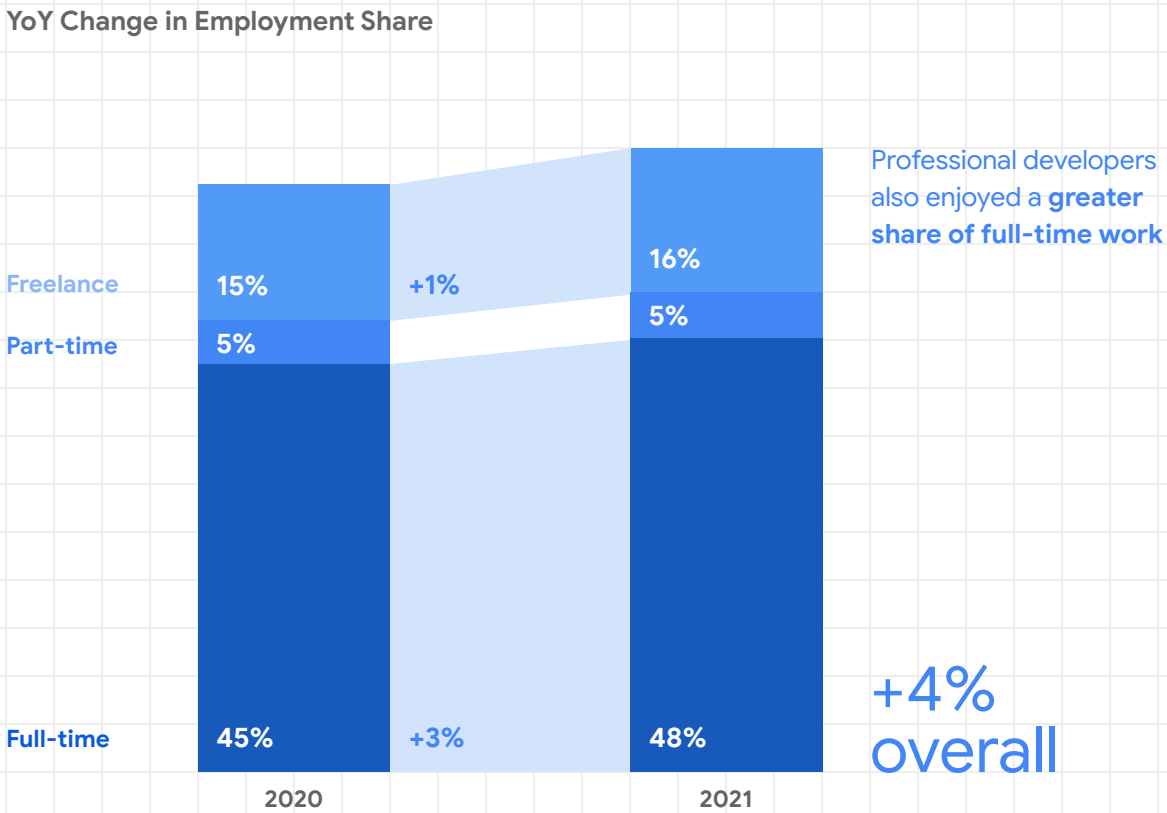
Sources: 1. Accenture African Software Developer Survey fielded 9/27/21-10/22/21,

Software developer compensation **rose by an average of 11% in 2021**. Mid-to-senior level developers and professionals in Advancing countries benefited most from this trend.



Graph Details: N = 550 (2020), 847 (2021) (1) only includes target markets and professional developers >4 years of experience (2) excludes respondents that make less than $100/year and more than $500K/year from coding professionally Sources: Stack Overflow Developer Survey 2020 and 2021 Note: Inflation increased from 2020 to 2021 by~10% (7.15% to 7.85%) across Africa (Statista) and the average exchange rate for South Africa Rand to USD increased ~12% (0.0611 to 0.0685)

Professional developers also enjoyed a greater share of **full-time work.**



Graph details: N=1556/2415 (2020), 1732/2525 (2021) (1) only includes target markets (2) Excludes "prefer not to say" Sources: Stack Overflow Developer Survey 2020 and 2021
Note: Inflation increased from 2020 to 2021 by ~10% (7.15% to 7.85%) across Africa (Statista) and the average exchange rate for South Africa Rand to USD increased ~12%(0.0611 to 0.0685)

Demand for African developers reaches new heights

17.

Booming startup ecosystem

23.

Remote work unlocks global opportunities

30.

Local businesses hire developers to grow online

Booming startup ecosystem

African startups raised over **$4bn** in 2021, **growing by over 2.5x** in 2021 over the previous year with fintech making up for **over half** of investments.[1]

40%

Increase in total **new startup deals closed** in 2020 compared to 2019 in Africa[1]

88%

Increase in **seed rounds and bridge rounds** in 2020 compared to 2019[1]

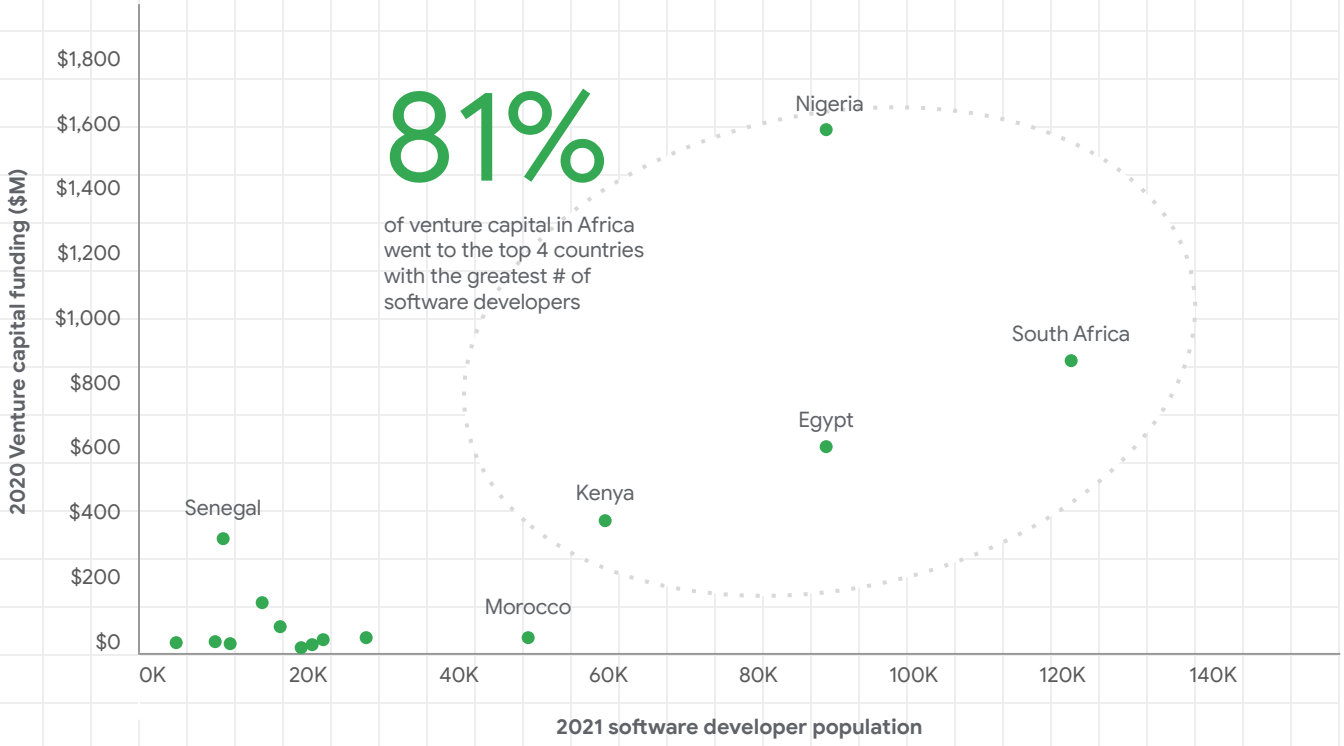
$4.3B+

Raised by African tech startups from local and international investors in 2021[2]

Sources: 1. Max Cuvellier, The Big Deal; 2. Estimated VC funding per country based on data available from Max Cuvellier, The Big Deal and Partech Partners

81% of venture capital funding in Africa went to the **top four countries** with the highest population of software developers.

Total venture capital funding in 2021 versus developer population, by country[3]

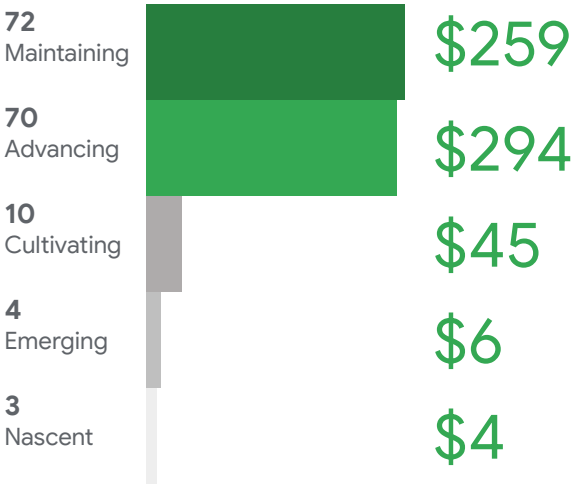


Sources: 1. TechCrunch; 2. Max Cuvellier, The Big Deal; 3. Estimated VC funding per country based on data available from Max Cuvellier, The Big Deal and Partech Partners

Maintaining and Advancing countries are hotspots for startup investment, while Emerging and Nascent countries **struggle to find funding** despite being critical employers for developers.

Number of Equity Rounds per country (2020)[1]

Avg. Total Equity Funding raised per country (2020, USD Mn)[1]



Led by **Nigeria ($307M)** and **Kenya ($305M)**, Advancing Countries secured more funding than ever in 2020, and this success has allowed their startup ecosystems to grow faster than ever and take advantage of digital transformation spurred by the pandemic.[1]

Ghana leads the Cultivating countries with a strong inflow of **USD $111M**. It's becoming an attractive tech market for leaders like Google and Twitter setting up offices.[1]

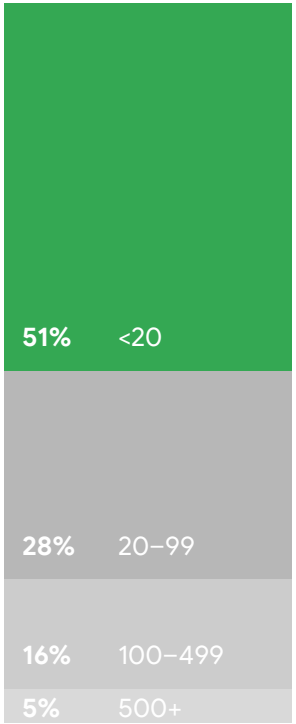
"Raising capital is the hardest thing to do in Ethiopia, especially if you are involved in technology. Investors want something visible and tangible; they don't really think tech is the future here."

Startup Founder, Ethiopia[2]

Sources: 1. Partech Partners 2. Interviews

Startups hire **over half** of Africa's developer population.

Developer Employment By co. Size[1]



Role of Startups for Junior Developers

"Many young developers care more about working with the latest technologies over income...so many **young developers end up working for startups instead."**

CS Professor, Tunisia[2]

"Startups are often the only companies willing to hire junior developers. The top employers in Africa really go after mid to senior-level talent."

Coding Bootcamp Executive, South Africa[2]

"My first job at **[real estate tech startup] gave me the foundation** I needed to start my career."

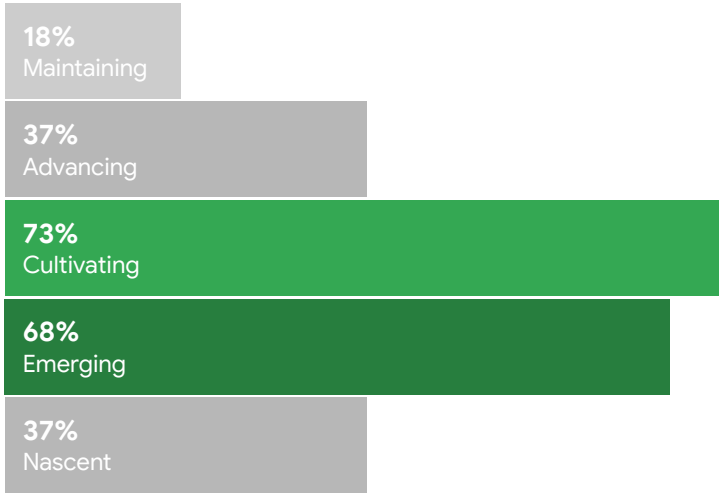
Software Developer, Uganda[2]

Multiple startup owners mentioned using **3–6-month long internships to vet / onboard junior developers,** who are often considered risky hires

Graph Details: N=1300, only includes respondents that are employed as developers
Sources: 1. Accenture African Software Developer Survey fielded 9/27/21-10/22/21, 2. Interviews

Startups are often the first businesses willing to hire junior developers, providing critical on-the-job training, especially in Cultivating and Emerging markets.

Percentage of developers hired in early stage startups *(less than 20 employees)* in countries grouped against 5 trajectory categories [1]



85%

of developers in Rwanda work for early stage startups

Graph Details: N=1300, "Small" considered <20 Employees, excludes N/A responses and those not employed as developers
Sources: 1. Accenture African Software Developer Survey fielded 9/27/21-10/22/21,

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Remote work unlocks global opportunities

COVID-19 accelerated the shift to remote work, and international companies are recruiting African developers at **record rates.**

South Africa's remote developer job platform, OfferZen, says it is seeing **record levels of hiring** activity, surpassing pre-COVID levels[1]

African developers created **40% more open-source repositories** on the software marketplace[2]

"**The tech talent market has become much more global**... starting in Q4 2020, businesses realized they could staff from anywhere and outsource on an ongoing basis"

Startup Founder, Ghana[3]

"We were seeing about **10–20% more demand coming from international companies** during 2020"

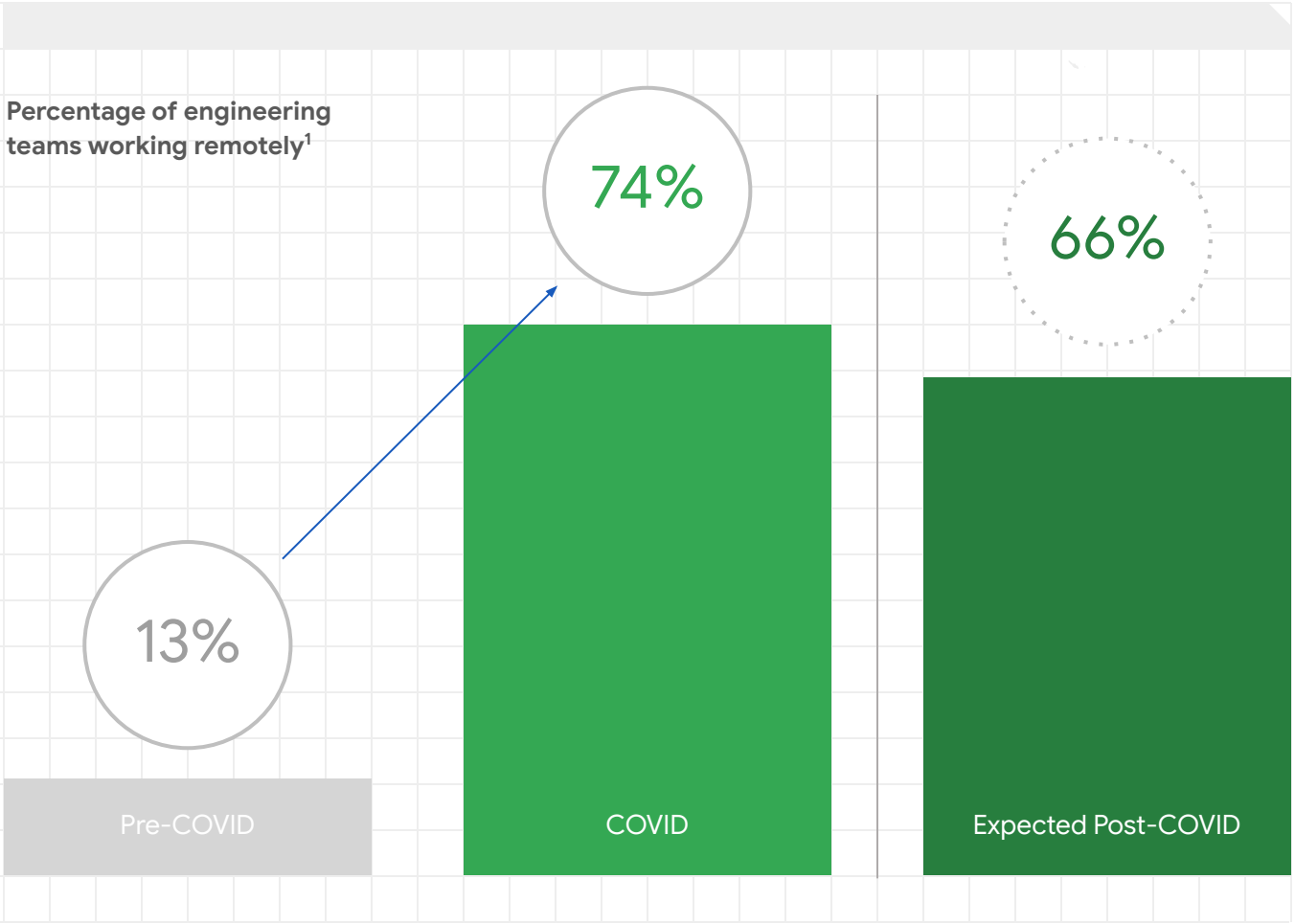
Coding Employment Platform Executive, Kenya[3]

"The **biggest competitor for talent right now is the international company** looking to outsource"

Coding Bootcamp Executive, South Africa[3]

Sources: 1-3. Interviews

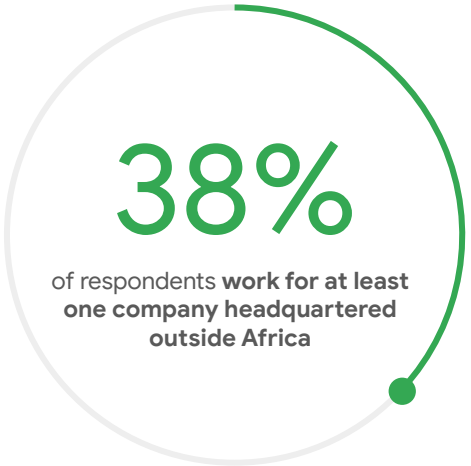
Experts predict that the **majority of global engineering teams will continue to work remotely** post-pandemic, which bodes well for African developers.



Sources: 1. Andela, 2. CBI, 3. TechCrunch, 4. Interviews, 5. IT Web, 6. Momo Africa.

African developers with experience are **gaining traction** with global and international companies.

Employer location (current)[1]



- **74%** in Egypt (boosts Advancing* country average to 48%)
- **16%** in Mozambique

"A lot more **international companies are now reaching out** and looking for engineers to hire out of our programs."

Coding Bootcamp Educator, Nigeria[2]

"I have **significantly more job opportunities now** – jobs that weren't even available in Africa have now opened up to developers like me"

Junior Developer, Uganda[2]

"90% of our applicants **expect to get international remote jobs"**

Coding Bootcamp Educator, Nigeria[2]

Graph Details: N = 1300, only includes respondents that are employed as developers
Sources: 1. Accenture African Software Developer Survey fielded 9/27/21-10/22/21, 2. Interviews
*Note: Emerging countries include Tunisia, Algeria, Ivory Coast, Senegal; Advancing countries include Egypt, Nigeria, Kenya

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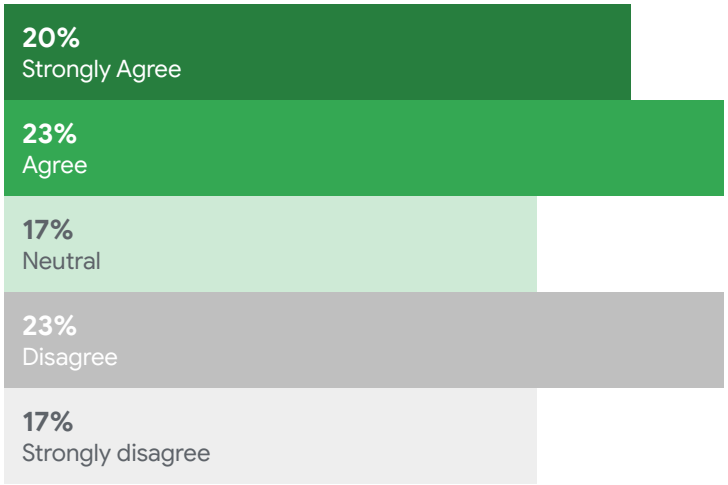
Many African developers learned to code for **international work opportunities.**

Developers that learned to code for the opportunity to move to another country to work[1]

Question asked: Do you agree or disagree with a statement: I learned to code for the opportunity to move to another country to work



33%

of developers in Emerging Countries* strongly agree that they learned to code for international opportunities[1]

"All the best developers want to work for global organizations to make more money. This is the **biggest issue** in the market"

Startup Founder, Ghana[2]

Graph Details: N = 1600, includes professional coders as well as hobbyists
Sources: 1. Accenture African Software Developer Survey fielded 9/27/21-10/22/21, 2. Interviews
*Note: Emerging countries include Tunisia, Algeria, Ivory Coast, Senegal; Advancing countries include Egypt, Nigeria, Kenya

Developers working for international companies have an average of **1.4x more years of experience** than those working for local businesses.

6 years

Professionals employed with global companies have on average 6 years experience

4 years

Professionals employed with local companies have on average 4 years experience

"Most international companies can't afford to take the risk of waiting for people to get up to speed. They need assurances of strong, quality talent that can do the job, which usually translates to **more senior talent"**

Startup Founder, Ghana[2]

Sources: 1. Accenture African Software Developer Survey fielded 9/27/21-10/22/21, 2. Interviews
Note: all survey responses with an open-ended top answer choice (e.g., "more than 12 years") quantified as 1.75x the top threshold

They also make **1.4x more monthly income** than professionals working for local companies. It's difficult for local startups to compete with higher compensation.

1.4x

On average, professional developers working for an **international company** make **1.4x more monthly income** than those that work for a local African company[1]

"Senior engineer salaries have doubled in the past year because large international companies are entering the market and bidding them up."

Startup Founder, Egypt[2]

"International companies with deeper pockets are our biggest competitor when it comes to recruiting top engineering talent."

Startup Founder, South Africa[2]

"Most startups are getting **out-bid by international companies for top senior talent** so they either outsource to India or the Middle East"

Venture Capitalist, South Africa [2]

Sources: 1. Accenture African Software Developer Survey fielded 9/27/21-10/22/21, 2. Interviews
Note: all survey responses with an open-ended top answer choice (e.g., "more than 12 years") quantified as 1.75x the top threshold

Local businesses hire developers to grow online

The pandemic also **accelerated tech adoption** across Africa.

22% of Sub-Saharan African SMBs report **starting or increasing use of the internet, social media, and digital platform**s in 2020[c]

"This past year has highlighted the **robustness of companies that were able to take their operations online,** empower remote work, and, ultimately, adopt tech to power their processes, services and products"

Outsourcing Platform Executive, South Africa[2]

"One of our top performing tech portfolio companies experienced 200% top line growth and **doubled its headcount in just this last year"**

Venture Capitalist, South Africa[3]

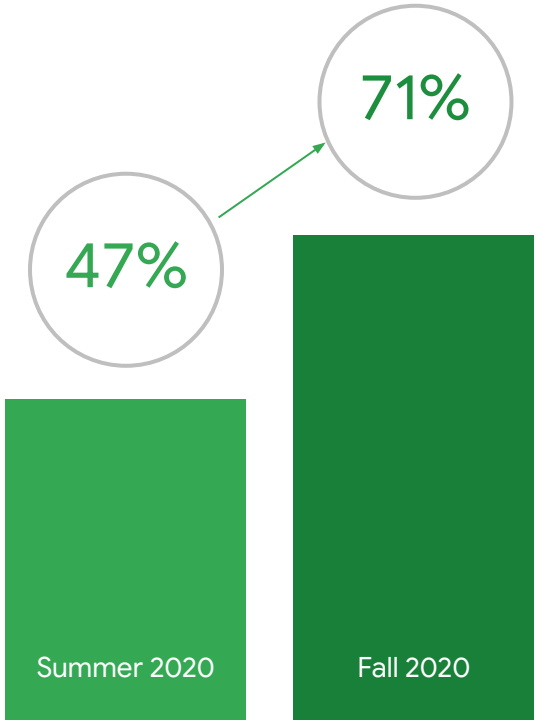
"Our sales have drastically increased since COVID and we've been doing quite well since"

Startup Founder, Egypt[3]

Sources: 1. WorldBank , 2. IT Web, 3. Interviews

Kenya boasted a highly favorable business and technology environment and increased digital adoption across sectors.

Digital Technology Adoption
Summer to Fall 2020[1]



By Sector[2,3]

	Summer 2020	Fall 2020
Manufacturing	47%	80%
SMBs	37%	64%

The largest increase in the proportion of firms using digital solutions was experienced by **manufacturing and SMBs.**

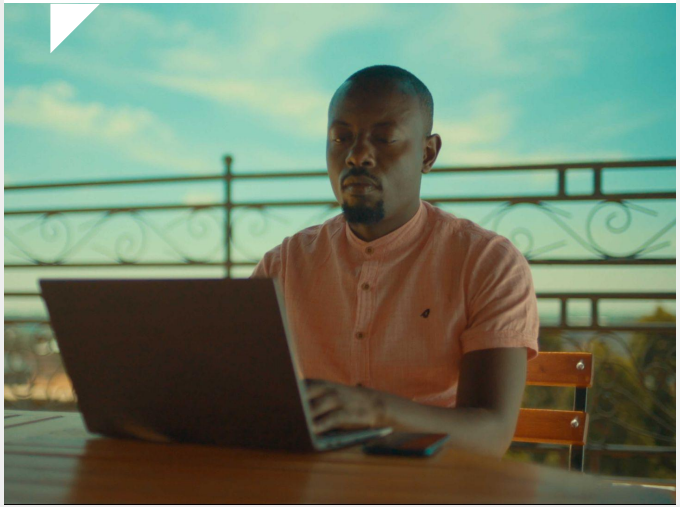
Sources: 1. WorldBank , 2. IT Web, 3. Interviews

Ahadi Movers adopted digital tools, growing by 80% in 2020 with Google My Business and Google Ads despite the shrinking economy.

Ahadi Movers, a moving and relocation company based in Nairobi, Kenya, grew its business from scratch with Google My Business and Google Ads with their success. They continue to expand, hiring more team members and serving between 70 and 100 customers a month.

"If there was no Google My Business, **I don't think we'd be in business today**. **My confidence has grown over the last five years.** We want to be the most preferred moving and relocation company in Kenya."

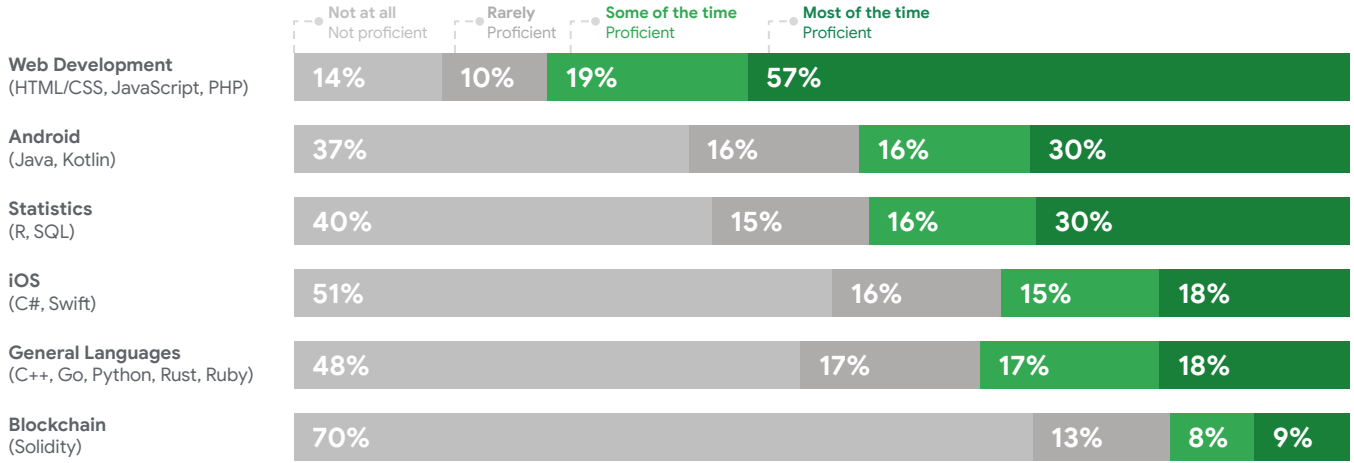
Victor Rasugu
CEO, Ahadi Movers LTD



Web development and data analysis are in especially **high demand** as businesses go online for the first time.

Frequency of Coding Language Use[1,2]

(N = 1600)



+13%

African developers use **PHP** (often used for legacy back-end web development) **+13%** more than the global averages[3]

+6%

African developers use **HTML/CSS** **+6%** more than the global averages[3]

+8%

African developers use **Angular** **+8%** more than the global averages[3]

Sources: 1. Accenture African Software Developer Survey fielded 9/27/21-10/22/21 , 2. Interviews, 3. StackOverflow 2021

Education and access will drive growth

36.

Key challenges facing developers

48.

Creating opportunities through education and training

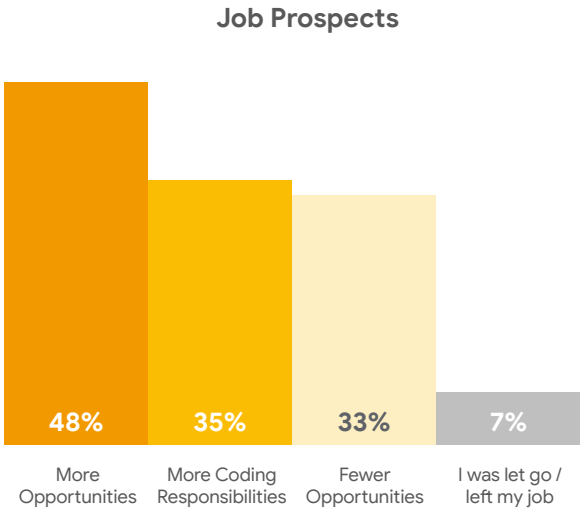
58.

Governments improving the developer experience

Key challenges facing developers

The pandemic has had a **mixed impact** on the developer population.

Impact of Covid-19 on Professionals[1]
N=1300, only includes professional developers



21% of professionals say that **COVID had no impact** on their learning or job prospects[1]

Sources: 1. Interviews, *(1) only includes target markets and professional developers < 4 years of experience (2) excludes respondents that make less than $100/year and more than $500K/year from coding professionally

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Learners, junior developers, and women developers faced more disruption.

"Many of our students are trying to learn by themselves, but they come to [our bootcamp] for **peer support and in-person education.** A lot of students come to us because they were struggling to learn online so **when everything went remote, they lost the real value**"

– Coding Bootcamp Executive, Nigeria[1]

"**Junior developers had an especially hard time adjusting to remote work** because they hadn't necessarily invested in a home office and stable internet. Many had poor working conditions and felt quite isolated as a result."

–Tech Consulting Executive, Kenya[1]

"There is no shortage of talented young women with an aptitude for coding - only a **lack of opportunities for women to access quality in-person training** that leads to high-value careers"

– Coding Bootcamp Executive, South Africa[1]

Sources: 1. Interviews, *(1) only includes target markets and professional developers < 4 years of experience (2) excludes respondents that make less than $100/year and more than $500K/year from coding professionally

Although many learners became professionals, there are **fewer people** in the developer pipeline.

Pipeline Growth

+ 11.5%

+ 1.5%

- 10.0%

- 3.5%

- 0.5%

Pandemic-driven learner attrition ultimately resulted in a net **-0.5% decrease in the "Pipeline" population**, which could impact future professional growth, unless they are able make up for lost time or new learner growth can compensate in 2022.

Sources: Accenture analysis based on Accenture African Software Developer Survey fielded 9/27/21-10/22/21, Stack Overflow Developer Survey 2020 and 2021, WorldBank, IWS, and OurWorldInData inputs

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Many junior developers face challenges in transitioning to mid-level and senior roles.[1]

01. The lack of training that accompanies remote work — as well as poor internet — limit success in work-from-home roles

02. Soft skills, including communication skills, are not well developed

Sources: 1. Interviews, *(1) only includes target markets and professional developers < 4 years of experience (2) excludes respondents that make less than $100/year and more than $500K/year from coding professionally

There is a pervasive perception that junior developers are often ill-prepared for professional software development.

"There is generally an over-supply of junior developers in Africa compared to senior developers... and recent graduates **struggle to meet the demands of most companies**."

–Tech Consulting Executive, Kenya[1]

"Junior developers often **lack the communication skills required** to work with a team in a professional environment."

– Coding Bootcamp Executive, South Africa[1]

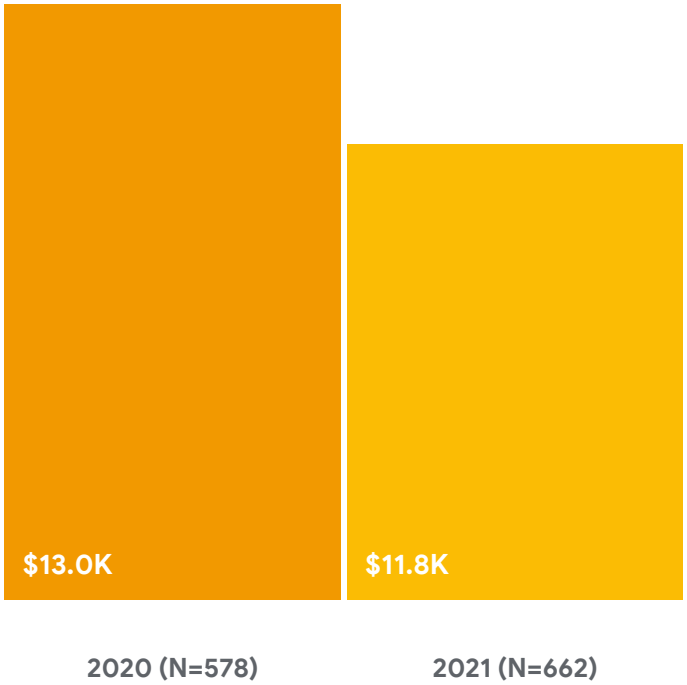
"We often **steer away from hiring junior developers** because the risk is just too high."

– Startup Founder, South Africa[1]

Sources: 1. Interviews.

Despite the average developer pay increase in 2021 by 11%, **junior developers saw a 9% pay decrease** as a result of oversupply of junior developers and perceived lower competence levels.[1]

Junior Developers Annual Income
(nominal)[2]



Sources: 1. Interviews, 2. Stack Overflow Developer Survey 2020 and 2021
*(1) only includes target markets and professional developers < 4 years of experience (2) excludes respondents that make less than $100/year and more than $500K/year from coding professionally

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Junior developers lost access to major training opportunities as software developer training programs moved to primarily focus on **fostering senior talent.**

Developer Talent Level

Senior-Level
&
Mid-level

Global companies need more mid-to-senior level developers. Training organizations adjusted their programs to meet demand.

- Senior talent has a higher ROI in terms of loan paybacks, success (graduation rates), and job placements[1]
- EdTech startups and bootcamps have become even more selective to ensure higher completion rates and graduate employability[1]

Notable Examples

TalentQL

TalentQL's clients demand for senior talent **(90%)** has driven candidate and curriculum focus to this group[2]

Andela

Andela initially focused on junior talent but re-evaluated investment due to **low ROI**. They pivoted to focus on connecting senior talent with global companies[3]

Decagon

Decagon only accepts **0.5%** of applicants. They have a **100%** graduation rate, **100%** loan repayment, **100%** job placement, and **410%** salary bump for graduates.[4]

Sources: 1. Accenture Interviews 2. Tech Cabal 3. Tech Crunch 4. Tech Crunch
Note: Though Andela no longer drives junior development in-house, it is still a key partner for junior training initiatives e.g., "ALCwithMicrosoft", "DecCTrainingwithAndela", and the "Africa developers scholarship program"

Andela

Andela was created to drive economic opportunity for African developers through software skills, and have expanded their virtual doors globally to focus on connecting senior technologists with global companies across 6 continents.

"The core concept of Andela is that brilliance is evenly distributed, but opportunity is not. We work to change this by enabling companies to tap into a global talent pool of engineers from over 90 countries and bringing trust to remote hiring. Through the Andela Learning Community [ALC], we have become one of the leading educators of technical talent across Africa and are excited to continue to grow opportunities in the region and around the world. To date, the ALC has enabled us to introduce software engineering to more than 175,000 learners globally, and we're just getting started."

Jeremy Johnson,
Andela CEO and co-founder

Women developers faced **more challenges** than men, given their more junior positions and the lack of childcare support during the Covid-19 pandemic.

01. Women developers are more prevalent in **junior and learner roles** that were more impacted by the pandemic.

1.3x

Women developers have 1.3x fewer years of professional experience than their male counterparts (**4.0** vs **5.1** years)[1]

02. Women are less likely to have practical coding experience as young people because they face **gender bias and stereotyping.**

12%

Women are 12% less likely to have written their first line of code before turning 18 than men developers[2]

03. Women were also heavily impacted as **childcare and home responsibilities increased** during COVID-19 lockdowns.

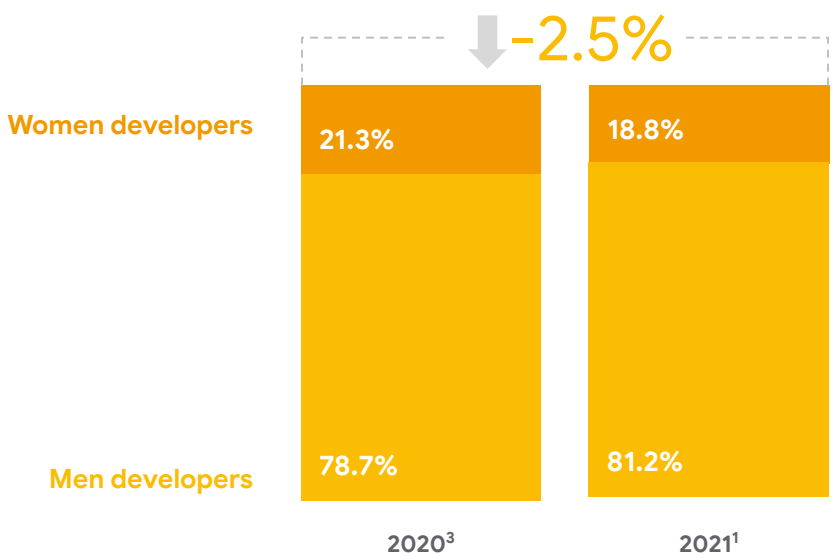
"Organizations that operate in more residential areas tend to have higher female participation because they can be closer to home and children."

Startup Founder, Ghana[3]

Sources: 1. Accenture African Software Developer Survey fielded 9/27/21-10/22/21, 2. 4. StackOverflow Survey 2021 (includes target markets, excludes N/A responses and those that did not identify as male or female), 3. Interviews, 4.

The **gender gap** between men developers and women developers **widened by 2.5%.**

Software Developer Gender Profile

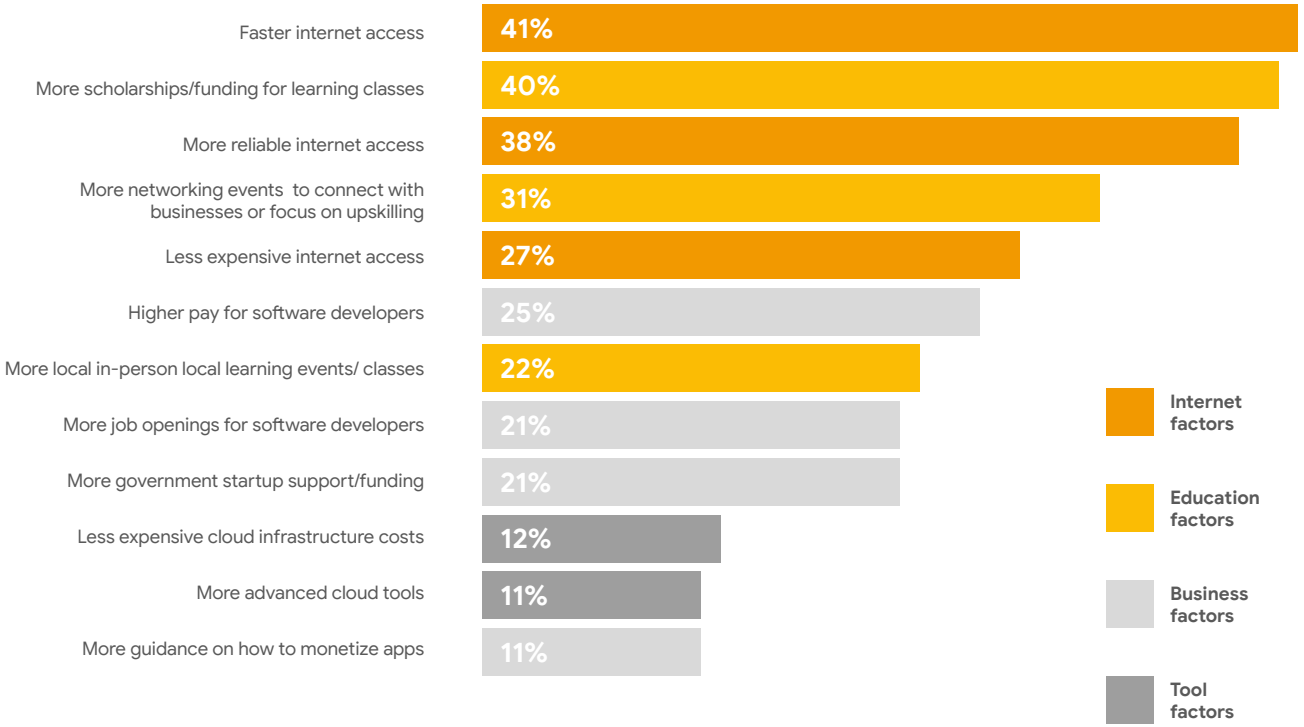


N=1112 (2020), 1100 (2021); gender share %'s weighted against each country's professional developer population[2]

Sources: 1. Accenture African Software Developer Survey fielded 9/27/21-10/22/21, 2. StackOverflow Survey 2021 (includes target markets, excludes N/A responses and those that did not identify as male or female), 3. Interviews &. Accenture African Software Developer Survey fielded April 2020

Educators, tech companies, and governments can help developers succeed by improving internet access, education, business support, and Cloud tools.

Top factors to improve developer experience



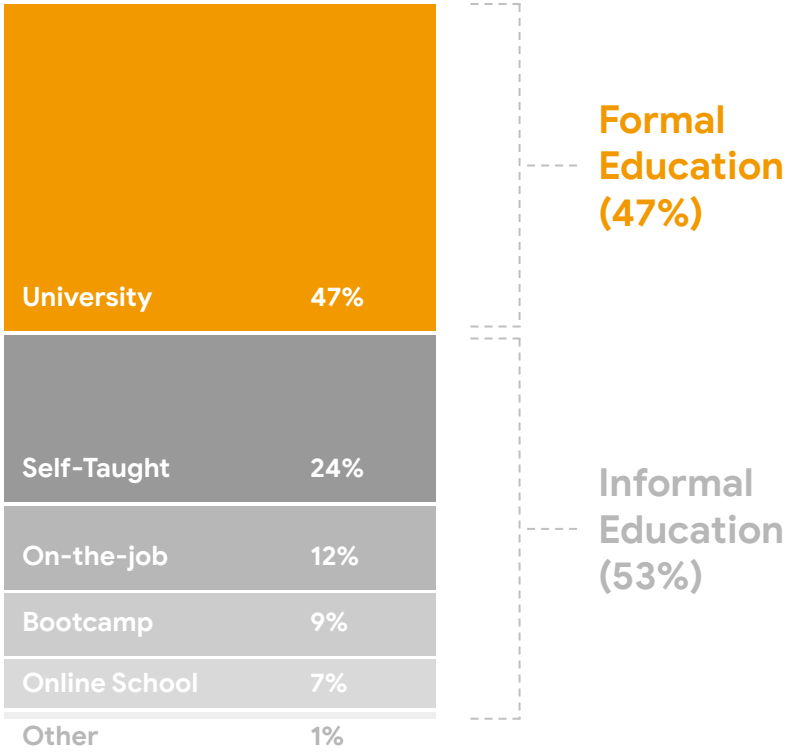
(N = 1600) Note: Each respondent selected top 3 out of 12

Graph Details: N = 1600; each respondent selected top 3 out of 12
Sources: Accenture African Software Developer Survey fielded 9/27/21-10/22/21

Creating opportunities through education and training

Universities remain the primary single education source for aspiring developers.

Primary Coding Education Source[1]
(N=1600)



Sources: 1. Accenture African Software Developer Survey fielded 9/27/21-10/22/21, 2. Interviews

Access to informal education options differs for countries across growth trajectories. Education programs are widely accessible in Maintaining and Advancing countries.

		Local Educators	Pan-Africa Educators
Maintaining	• In addition to its strong university programs, South Africa has a strong ecosystem of bootcamps and online schools with regulations that make L&D funding easier to procure to finance programs[1] • Its home-grown coding bootcamps tend to have larger class sizes (300-500+) and offer a greater variety of courses, ranging from fundamental to advanced[1]		
Advancing	• Nigeria and Kenya are home to a variety of large software skill training providers, while Egypt relies more on its robust government sponsored universities and global online coding programs • With the presence of coding programs offered by Andela, Decagon, and Moringa, Nigerian / Kenyan students have access to strong learning programs as the ecosystem develops		

Sources: 1. Accenture Analysis & Interviews

There are **fewer coding schools** available in Cultivating, Emerging, and Nascent countries

		Local Educators	Pan-Africa Educators
Cultivating	• As digital ecosystems improve, educators are expanding their efforts to Cultivating countries • Some regional providers operate locally, including NIIT in Ghana and Le Wagon in Morocco • These countries aim to boost domestic-led opportunities. For example, the Rwandan government opened Rwanda coding academy for software and web development skills training	Codetrain, Soronko Academy	Google, Cisco Networking Academy, Andela, Microsoft, 2KO, the knowledge academy, AWS, SAP, IBM, NIIT, Africa Code Academy
Emerging	• Bootcamps and coding schools have a more limited presence in Emerging countries. Traditional universities and schools dominate the ecosystem • Coding bootcamps and academies have been opened as edtechs in collaboration with private companies like Orange Digital Center and Sonatel Academy due to the lack of other funding	Sonatel Academy, Orange Digital Center	
Nascent	• Coding schools are primarily set up by NGOs empowering and upskilling young people in Nascent countries with foundational and intermediate IT skills • While Uganda has a few coding schools and bootcamps, other countries have even fewer options	Tecnicol 14 Anos, Developers.Institute	

Sources: 1. Accenture Analysis & Interviews

Informal educators adapted their approach during the Covid-19 pandemic by bringing in new sources of funding, offering remote learning opportunities, and enhancing their curriculum.[1]

Notable Initiatives	Challenges	Unique Solutions
we think code_	Students had limited access to **technical resources and facilities** in a remote model	• Explored **alternative funding via corporates** to provide for technical infrastructure to students • Quickly pivoted to **reopen facilities** as COVID-19 restrictions eased
Prioritized student support via corporate funding and agile curriculum development	Declining curriculum relevance in remote model **hindered student retention**	• **Developed new in-house curriculum** placing focus on mentorship and support
umuzi	Had **no remote applicant vetting capabilities**	• **Re-designed applicant testing methods** (online testing and proctoring, etc.) and changed employer trainer requirements
Collaborated with key employers to adapt to shifting demand and remote models	Witnessed **increased demand from employers** to reskill and upskill employees	• Worked closely with key employers to **modify curriculum per new needs and systems**
Andela	Developers **struggled with access to basic resources** like electricity, internet, and working space	• Partnered with CCHub to **provide a coworking space to developers** and access to quality internet
Supported the developers by providing infrastructure and modified trainings	Young developers had a **struggled with remote work because of soft skill challenges**	• Increased focus on communication and soft skills while **providing training on collaboration and communication**

Sources: 1. Accenture Analysis & Interviews

Global tech companies are investing in digital skill building across the continent to **improve job readiness** and alleviate the tech talent bottleneck.[1]

- AWS **re/Start cloud skills training program** launched in Kenya in 2021 in collaboration with getINNOtized and Ajira Digital Kenya. It will empower over one million young people to access digital job opportunities in Kenya, especially in cloud technologies (free, full-time, 12-week program)

- Google announced a plan to invest **$1billion over 5 years** to support digital transformation in Africa. The investment will include the landing of the subsea cable Equiano which will enable faster internet speeds and lower connectivity costs. It also includes low-interest loans to help small businesses and equity investments in African startups.
- Pledged **$50 million in African growth-stage startup investments** via its Africa Investment Fund (2021)
- Google Africa Developer Scholarship program **provided 40,000 new developer scholarships in Africa** across mobile and cloud development (2021)

- Plans to invest **$150M in digital talent development** by 2026, which will help about three million young people in Africa[2]
- Launched **5G DigiSchools in South Africa** in 2021 to improve basic educational and vocational skills at an early age[3]

- **Partnering with the Global Partnership for Education, Ministry of Education in Kenya** and other African governments to transform education with digital and data capabilities (2021)

- Set up **educational digital centers** in Cameroon and Ivory Coast in 2021, offering free digital programs (focus on Nascent and Emerging countries)[6]
- As part of its Engage2025 strategy, it plans to open an Orange Digital Centre in each of its African markets by 2025[6]

- Launched 'Africa Code Week,' a continent-wide digital skills development initiative engaging 4M+ young people across 37 African countries[8]
- Developed the **'Skills for Africa' training and job creation program** to help young unemployed and underemployed Africans[9]

Sources: 1. Accenture analysis & interviews 2. All Africa 3. Huawei , 4. Ericsson, 5. Developing Telecoms, 6. Orange.com, 7. Nokia, 8. SAP, 9. SAP, 10. Intelligent CIO, Google, TechCrunch, BusinessTech, Microsoft

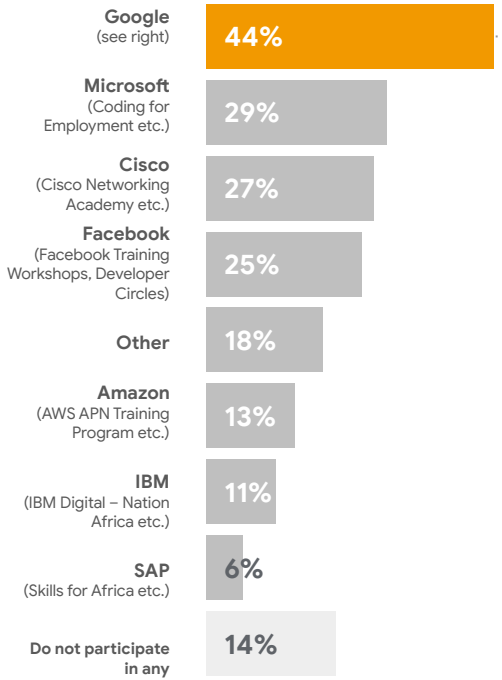
Google **continued to grow** their pan-Africa developer and startup initiatives.

- In 2021, Google offered **40,000 new mobile and cloud developer training scholarships for Africa** in partnership with Andela and Pluralsight.
- In 2021 Google also announced **$3 million in non-dilutive funding for Black-founded startups in Africa**[1] through the Google for Startups Black Founders Fund Africa program.
- Long-term Africa programs and initiatives **continued to grow,** including Google for Startups Accelerator Africa and Google-supported developer communities including Google Developer Groups (**166 communities across 37 African countries**)[2], Google Developer Student Clubs, and Women Techmakers.

Sources: 1.BFF announcement 2. Google Developers Groups

Almost half of all developers have participated in a Google training program.

Major Tech Company Training Programs[1]



29%
Google Training Workshops
(e.g., Google Africa Developer Scholarships, Google Study Jams, etc.)

27%
GDGs and DSCs
(i.e., Google Developer Groups and Google Developer Student Clubs)

14%
Women Techmakers (WTM)

> **"Google and Microsoft have the best programs**...Google programs are valued for the **online learning credits** they provide and the fact that they have so many communities across the country...Microsoft programs are valued for their maturity and scale"
>
> **University Professor & Incubator Contributor, Tunisia[2]**

> One of the biggest selling points for these corporate sponsored communities is their ability to **connect young developers with global opportunities."**
>
> **Tech Consulting Firm Managing Director, Kenya[2]**

Graph Details: N = 1600, % of respondents that have participated in at least one of tech company training programs
Sources: 1. Accenture African Software Developer Survey fielded 9/27/21-10/22/21, 2. Interviews

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Organizations across the continent are focusing on supporting underrepresented developers, particularly women.

Microsoft Women Techsters

- In 2021, Microsoft partnered with Tech4Dev to launch the Women Techsters Initiative. They aim to train girls and women (ages 16 to 40) across **54 countries** in Africa in coding and deep tech skills[7]
- The initiative will provide **specialized training in technical skills**, including software development, product design, product management, data science and artificial intelligence (AI) engineering and cybersecurity[2]

She Code Africa

- Since 2018, She Code Africa has conducted 4 editions of **She Code Africa Mentoring Program** to upskill new coders. 500+ women across Africa took part in the program.[1]
- In 2021, they **launched Contributhon**, a bootcamp where African women are paid to work with open-source organizations on selected projects with dedicated mentors[2]

Umuzi

- In 2019, Umuzi **partnered with BBD,** a leading software development company, to support underemployed women who want to become developers[3]
- In 2020, Umuzi also ran a **women in tech drive** in Nigeria and Kenya to increase awareness and exposure[4]

Sources: 1.Dig.watch 2. Medium 2.Jenkins 4. Accenture Interviews

To level the playing field for women developers, organizations offer scholarships and free bootcamps.

Google Women Techmakers

- Google's Women Techmakers program provides **visibility, community, and resources for women in technology** with **over 80,000 members worldwide**[1]
- The Women Techmakers Scholars Program are awarded to women studying undergraduate and postgraduate computer science at university.[1]

Hyperion Dev

- Female intake for HyperionDev in **2021 has increased to 60%** in line with its aim to bridge the STEM gender gap[2]
- "Our coding boot camps give young women a fighting chance to become confident, job-ready developers in mere months, rather than years." **HyperionDev CEO** [6]

We Think Code

- Offers **300 tuition-free learning programs annually**, including a four-week coding bootcamp[3,4]
- Devised a **unique selection method** to focus on aptitude with an online game

Sources: 1. Women Techmakers 2. IOL 3. Jenkins 4. Accenture Interviews
Note:

Governments improving the developer experience

Government support for developers differs within the **five growth trajectory types.**[1]

01.

With its mature tech ecosystem and talent pool, the continent's only **Maintaining** country, South Africa, hasn't made bold regulatory strides to further bolster the tech ecosystem.

02.

In **Advancing** countries, there is a strong commitment to empowering tech businesses and upskilling youth, especially in Kenya,

03.

Cultivating countries have the strongest government support for technology; they're focused on catching up with advancing markets and attracting investment.

04.

Emerging countries' governments haven't modernized fast enough, however, they've increased their focus on digitization and improving the tech and startup landscape to drive economic growth.

05.

Nascent countries have experienced unpredictable political and government scenarios, hampering new business growth. Government initiatives focused on technology and businesses are limited and, at times, unfriendly.

Sources: 1. Accenture Analysis & Interviews

Key areas of focus for governments and the private sector are grouped based on the Google's Digital Sprinters report.[1]

Physical Capital

Physical Capital refers to connectivity and digital infrastructure. Infrastructure does not depend solely on investments, but also on the way that it is managed.

Human Capital

There are a range of interconnected issues under the Human Capital area, including developer training, job security, entrepreneurship, and gender discrimination.

Technology

Technology includes initiatives to proliferate digital data, machine learning, and cloud computing to empower the growth of next-generation technological innovations.

Competitiveness

Competitiveness encompasses policies that promote competitive and open markets, interoperable regulatory standards, and tax regimes that are predictable and based on international standards.

Sources: 1. The Digital Sprinters report

Governments in Cultivating countries offer the **strongest support** through a range of ambitious initiatives.

Physical Capital	**Increasing 4G availability**	As part of the Vision 2020 project, Rwanda has successfully extended its 4G coverage to 96% of the nation, enabling people to access a cashless system on buses and Wi-Fi on public transportation.[1]
	**Reducing data costs**	Ghana's government is relaxing telecom licensing rules to lower data costs. Leaders plan to broaden the scope of its telecom licenses so operators have more spectrum available for internet use, lowering data costs.[2]
Human Capital	**Government Coding Academy**	In 2019, the Rwandan government and the Swiss Agency for Development and Cooperation (SDC) launched the Rwanda Coding Academy to train students on cyber security and software programming.[3]
	**Digital skills training initiative**	The Moroccan government launched "Take IT Forward" project to increase the employability of young graduates by training youth in digital skills, soft skills and supporting in ICT-related placements.[4]
Technology	**Advanced technology focus**	The Rwandan government set up the Technology Center of Excellence (CoE) for digitalization, security and artificial intelligence.[5] Ghana also set up digital centers to reduce data costs and encourage international investments[9]
	**AI Training School**	The Moroccan government opened Africa's first AI training school, Euromed School of Digital Engineering and Artificial Intelligence, to offer training in advanced technologies like robotics, artificial intelligence and cybersecurity.[6]
Competitiveness	**Improving economic freedom**	The Rwandan government boosted the economic freedom – with Rwanda ranking 2nd among 47 countries in Sub-Saharan Africa region,in the 2020 Index of Economic Freedom. It's also taken strong measures to become the 2nd ranked country in Africa for Ease of Doing Business[7]
	**Building global market confidence**	"I believe Ghana is poised to overtake some of the most powerful emerging economies of the world and catapult the entire African continent to an advanced digital league." **Cluster Head- Smart Africa, Tata Communications Transformation Services Limited (TCTS)**[8]

Sources: 1. IFC Report 2. Bloomberg 3. ThisisAfrica , 4. WeHubIT 5. RDB 6. VenturesAfrica 7.Heritage 8. TataCommunications, 9. . Ministry of Commerce,Bloomberg

While South Africa has **embraced their status quo**, Advancing countries are rapidly improving their technology and regulatory landscape.

Physical Capital	**Improving internet infrastructure**	With planned investments of $360M, Egypt aims to improve internet connectivity and upgrade internet speeds of 60M people in rural areas[1] with $360M of planned investments.
	**Increasing broadband penetration**	In 2020, the Nigerian Communications Commission (NCC) announced $732M of investments into revamping and building infrastructural fibre networks and $137M of investments in the new National Broadband Plan to achieve 70% broadband penetration by 2025[2]
Human Capital	**Information and communications technology (ICT)**	Information and communications technology (ICT): MCIT Egypt launched the "Our Future is Digital" to train 100,000 young Egyptians and develop their ICT skills in areas of high-market demand, including website design, data analysis, and digital marketing3
	**Digital skills training**	Post allocation of funding from COVID-19 budget, Nigerian government is scaling up its programs to offer 500,000 youth training in digital skills, including artificial intelligence and robotics, coding and more.[4]
Technology	**Advanced technology focus**	Nigerian Government is planning to set up a Centre for AI and Robotics (CFAIR) focused on emerging technologies, including networking, research development, AI5
	**AI specific portal**	Egypt has launched a special AI Portal to showcase its focus on digitalization, national AI strategy and the latest AI events and projects[6]
Competitiveness	**Reforming laws and regulations**	Kenyan and Egyptian government have enacted new bills and data privacy laws to create a more favorable environment for startups and attract more investments; Nigeria and South Africa lag on this front.[7]
	**South Africa Stagnant Business Laws**	"Startups have to comply with same regulations and standards as a 5000+ employee company" (Founder, South Africa Startup)7 which require resource-intensive administration that can overly cumbersome and costly for startups that have only a few employees.

Sources: 1. Capacity Media 2. African.Business 3. Trade.GOV. 4. IntelRegion 5. SyncedReview 6. DailyNews 7.Accenture Analysis & Interviews

Emerging countries' governments are gradually implementing tech-friendly initiatives, while Nascent countries' governments are **limited in their support.**

Physical Capital	**Lagging internet infrastructure**	Nascent countries have more limited internet infrastructure with low internet penetration and availability[1]. They also struggle with high internet pricing (1.6x of Cultivating countries) and excessive taxation. For example, Uganda is launching a 12% new internet tax[2]. Government-enforced internet shutdowns, including Uganda and Tanzania limiting internet during elections,[3] also limit growth.)
	Barriers limit developer population	"Internet costs are very high, and ISPs are not strong. Most of the time, we have to rely on mobile hotspots to go online and work. This creates everyday challenges for software developers." **Software Developer, Uganda**[1]
Human Capital	**Limited focus on upskilling and training**	There is limited activity in terms of digital skills training undertaken by emerging and Nascent countries' governments.[1]
	Tech talent not a top priority	"Government has not taken any additional steps to enhance digital skills or train people. During COVID-19, the focus was on the well-being of people and economic conditions of the country, and there have not been any specific initiatives to enhance the digital skills. **Tunisia AI Expert**[1]
Technology	**Huawei partnerships across the region**	Ivory Coast has partnered with Huawei to design its national digital economy strategy called "Côte d'Ivoire Numérique 2030" (Digital Côte d'Ivoire 2030). Senegal is moving all government data and digital platforms from foreign servers to a new national data center.[4,5]
	Limited partnerships and dependence on Chinese firms	While governments have partnered and tried to improve technological capabilities, there has been a high dependence on Chinese firms for the same[6]
Competitiveness	**Government initiatives**	Emerging countries have created targeted initiatives to improve internet access and the startup landscape while Nascent countries cope with funding challenges and limited government support[1]
	Government sponsored Startup fund	In late 2020, Algeria launched its first fund for startups to address the gap in the market.[7]
		"The funding scene in Uganda is quite small. One of the main challenges facing Ugandan tech entrepreneurs is lack of access to funding, as the country has few investment firms." **D**igital Health Access CEO ,Uganda[1]

Sources: 1. Accenture Analysis & Interviews 2. QZ 3. BBC 4. Dig.watch 5. AllAfrica 6. VoaNews 7. AfrikanHeroes

Appendix

Details on our research and reporting methodology

Conduct Research

Surveys

Fielded and analyzed a survey of software developers across the **16 target markets**

N=1,600

Secondary Research & Interviews

Conducted interviews with local experts and compiled external research on the forces influencing the developer landscape

25

Total interviews completed to date

Details on our research and reporting methodology

Quantify & Map

Model

Leveraged primary and secondary data sources to quantify the YoY software developer population change

1. Formal Education

2. IT Infrastructure

3. Self-Identified Developer

4. Formal Education

Growth Factors
% New Professionals

Attrition Factors
% Professional Job Loss

2021 Professional Developer Population Size

Details on our research and reporting methodology

Outputs

Developer Size Model

Approximate developer population in Africa

Executive Summary

High-level findings and comparisons across analyzed markets

Analysis Report

Written review of Africa developer market and how it's changing

Authors

Google's mission is to organize the world's information and make it universally accessible and useful. Through products and platforms like Search, Maps, Gmail, Android, Google Play, Chrome and YouTube, Google plays a meaningful role in the daily lives of billions of people and has become one of the most widely-known companies in the world. Google is a subsidiary of Alphabet Inc.

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