

REPORT

The New Economy of Africa:

Opportunities for Nigeria's Emerging Technology Sector

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Summary

Nigeria has a vibrant and growing tech sector. Large firms are delivering services in healthcare, agriculture, and finance while smaller firms are providing e-commerce platforms and other retail-related services. In a survey of tech firms conducted in 2018, we find that most firms start small but grow quickly, more than doubling their size in the few years since the start of operations. Many are addressing inefficiencies in distribution of goods and services. But firms are still hampered by the business environment, notably unreliable electricity and lack of access to credit. Most suffer significant power outages, forcing them to purchase generators. Few firms have access to financial institutions or venture capitalists, relying instead on family and professional networks. Finally, tech firms employ very few women. While the Nigerian government has made the tech sector a priority, it needs to do more to improve the basics of the business environment. The government and the private sector must also take steps to increase the participation of women in the tech sector.

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1. Introduction

Nigeria's ICT (information and communication technologies) sector has grown from less than 1 percent of GDP in 2001 to almost 10 percent of GDP today (OC&C Consulting, 2018). Nigeria has also surpassed South Africa to emerge as a premier investment destination with 55 active tech hubs raising a total of US\$ 94.9 million, while South Africa raised US\$60.0 million with 59 active start-ups (Usman, Choi, & Dutz, 2019). The country is also Africa's biggest technology market and accounts for 23 percent of internet users in Africa with 122 million people online in December 2018 (Internet World Stats, 2019). It also has the largest number of telecommunications subscribers, with a tele-density figure of almost 90 percent (Nigerian Communications Commission, 2019). The growth of the tech sector offers new possibilities for Nigeria's growing labor force, in terms of employment and entrepreneurship.

Nigeria's tech sector is an outgrowth of the Global Systems for Mobile Communications (GSM) System, which was introduced in Nigeria in August 2001, a few months after the creation of the National Information Technology Development Agency (NITDA). Almost 20 years later, over 100 million people have access to mobile telephones and internet use has risen to almost 50 percent (Internet World Stats, 2019). Mobile telephony and internet connectivity, combined with urbanization and population growth, have created an environment for technology products and services.

The Nigerian tech sector has benefitted from entrepreneurs moving to the country to set up companies (Bright, 2016). In 2012, two Harvard Business School graduates cofounded Jumia, a Nigerian e-commerce site and one of the first tech start-ups in the country. Since then tech firms have been established in the fields of energy, agriculture, banking, transportation, logistics, health, and finance. Several large tech companies have emerged over the past few years; these have attracted international attention and funding.

Nigeria's tech sector has often found creative solutions to fill gaps left by the state. A weak public education system has provided room for education ("edutech") start-ups that try to make learning more accessible and effective. Financial technology (fintech) start-ups are looking to engage segments of the population that cannot access traditional financial services (see Box 1).

Box 1. Accountinghub

Small and medium enterprises (SMEs) form a large chunk of the private sector in Nigeria, but most lack access to accounting and bookkeeping services. Accounting firms in Nigeria are expensive and mostly target larger corporate clients; they are not designed to work for small businesses. This is a significant problem for the sector as poor accounting is one of the top reasons why many small businesses fail.

Sensing the gap in the market, Chioma Ifeanyi-Eze set up Accountinghub in 2015 to provide bookkeeping services to small businesses. It brings together a collection of accountants and consultants to offer quality accounting services in an online marketplace, allowing businesses to quickly arrange and pay for a variety of services. More recently it has also launched an online academy with courses for small business owners on the basics of finance and bookkeeping.

With its office in Lagos, Accountinghub has helped over 250 small businesses across a variety of sectors and has hired 20 accountants (Independent, 2017). It also has a dozen or so clients located in Abuja, and Ms. Ifeanyi-Eze plans to set up another office in the capital soon. As the Nigerian government takes step to bring more SMEs into the tax net, she expects the need for her firm's services to grow in coming years.

Agriculture (“agritech”) start-ups are seeking to solve the logistics of food waste in the country and learn how to get produce from the farm to the end consumer in the most efficient and effective manner.

One example of an innovative start-up is Nigeria’s digital blood bank—LifeBank Nigeria—which has transported over 9,000 units of blood for frontline health facilities across the country and attracted \$200,000 in funding last year (Kazeem, 2018) (see Box 2). Another example is the software firm Andela, which has trained hundreds of software developers and engineers for companies around the world. Andela has received over \$80 million in capital investments towards its plan to train 100,000 software developers across Africa (IFC, 2018).

Box 2. LifeBank

One of the major challenges for the healthcare system in Nigeria is the shortfall in equipment and supplies at health facilities. The story is no different for blood, which is needed for transfusions during surgeries and related procedures. There are constant blood shortages and in times of need, Nigerians are regularly forced to seek family and friends to donate blood for transfusions.

LifeBank, a Nigerian start-up founded by Temie Giwa-Tubosun, is a social enterprise focused on developing a better way of delivering blood to hospitals in Lagos. Using WHO-approved equipment, LifeBank has transported about 9,000 pints of blood and saved more than 2,000 lives (Kiunguyu, 2018).

The case of blood shortages in Nigerian hospitals is not necessarily a tale of inadequate supply, but rather the inability to locate the required blood type in time. There are plenty of blood banks in Lagos that collect, test, and store blood for use. However, hospitals traditionally worked with only one or two banks, and this limited the amount and types of blood they had access to.

The main achievement of LifeBank has been to link hospitals with blood banks through its online platform. LifeBank has 40 blood banks and 300 hospitals on board currently and continues to expand (Kiunguyu, 2018). The team sorts orders based on urgency, location, and price and keeps its blood deliveries at the optimal 10 degrees Celsius. Riders deliver the blood in boxes that can be opened by the recipient only via a Bluetooth connection or key.

Farmcrowdy is a digital agriculture platform that supports rural farmers by providing them with farm inputs, trainings, and easy market access for their farm produce. Similarly, Qataloog was developed by Martins Fidelis, formerly employed by Oracle, as a higher education learning content distribution engine that provides technology for catalogue analytics for students, researchers, and the Nigerian public.

Tech firms have begun to supply the agricultural sector, which still employs over 35 percent of the Nigerian labor force (World Bank Data, 2019). The Nigerian agricultural sector mostly comprises small-scale farmers who face considerable challenges. By providing market linkages, training, and financial services, tech firms such as Thrive Agric and Farmcrowdy are promoting increased growth and employment in the sector as well as improving food security.

Start-ups in healthcare are particularly attractive to investors. One example is 54gene, a genomics company that raised \$4.5 million in a seed round; investors included Y Combinator, Fifty Years, Better Ventures, KdT Ventures, Hack VC, and Techhammer. MDaaS Global, which provides diagnostics services, raised \$1 million recently (MDaaS Global, 2019) in a seed round led by Consonance Investment Managers with participation from Techstars, FINCA Ventures, the Fund for Africa's Future, and Greentree Investment Company. Helium Health, an electronic medical record start-up, raised \$2 million in 2017. Overall, fintechs, which provide financial services through the use of technology (PwC, 2015) dominate the landscape. In 2018, fintechs attracted the vast majority of funding in Africa, with investments of almost \$300 million (Figure 1). But not all are successful; the e-retailer Konga has struggled to make a profit (see Box 3).

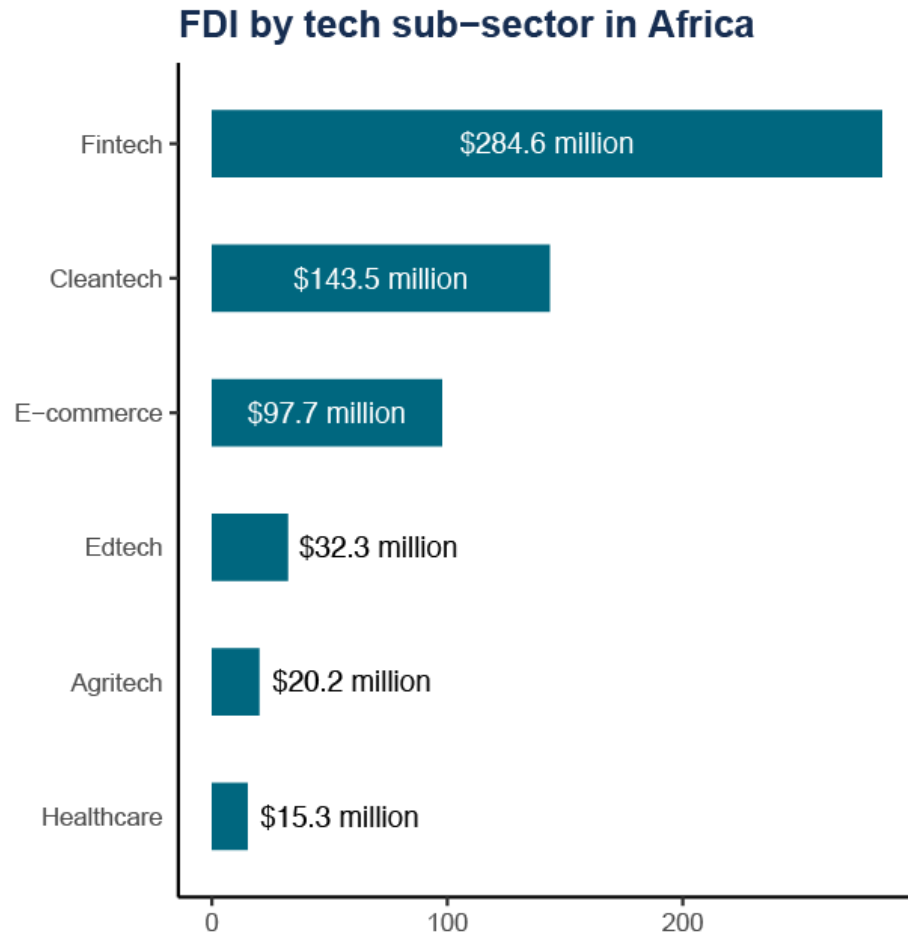
Box 3. Konga

Although the Nigerian tech sector is experiencing a boom, there are still plenty of risks for tech enterprises in the country. Investors are reluctant to do business in the country, given the lack of profitable exits and some high-profile failures.

One such example is the online retail business Konga, established in 2012. As one of the first start-ups in Nigeria to win major backing from VCs, there were high hopes for its success. However, it has struggled to establish online shopping as a viable business at scale in Nigeria, given the many logistics and supply chain difficulties in Africa's largest economy. Konga's active customer base in 2016 was 184,000, which is less than 1 percent of the country's population (Kazeem, 2017).

Towards the end of 2017, Konga cut 60 percent of its staff in a bid to stem losses, despite raising nearly \$100 million in investment since its start date (Kazeem, 2017). Two months later it was let go in a fire sale after investors refused to offer more cash, destroying much value and jobs in the process.

Figure 1. FDI by tech sub-sector in Africa



Source: (Quartz Africa, 2019)

2. A Survey of Nigeria's Tech Firms

In the fall of 2018, ONE Campaign and the Center for Global Development surveyed 93 technology firms, mostly in Lagos and Abuja, to better understand challenges and opportunities in the tech sector. The survey sought to reveal the composition of firms in the tech sector and to describe the constraints facing these firms. To understand the challenges and opportunities in the Nigerian tech sector, a data collection tool was crafted drawing upon various sources, including the World Bank Enterprise Surveys. The data collection tool comprises questions on the operations of firms, the business environment, access to finance, and the degree of innovation in the tech industry. The aim of this work is to support public and private sector efforts to expand the tech sector in Nigeria so that it continues to be a source of employment and inclusive economic growth.

In the absence of comprehensive firm lists, respondents were selected using an “aerial” sampling methodology. The first step was the identification of firms in the Yaba Local Government Area of the city of Lagos as well as in other parts of Nigeria. Over 100 tech firms were identified; 93 of these firms responded to our survey. Most are located in Yaba. However, the survey sample included a few tech firms located in other neighborhoods in Lagos, as well as Abuja, Nassarawa, Kaduna, and Cross-River States in North Central, North Western, and South-Southern Nigeria. Overall, 61 firms were surveyed in Lagos, 4 in Nasarawa, 1 in Cross-River, 2 in Kaduna, and 25 in Abuja.

Yaba was selected as the primary study location because of its concentration of technology firms. Several factors account for this concentration. The major fiber-optic cable for the city of Lagos passes through Herbert Macaulay Way, the major thoroughfare for the neighborhood. Yaba is also home to three tertiary institutions—the University of Lagos, Yaba College of Technology, and the College of Education, Akoka are all situated in Yaba. The first major private sector incubation hub in the city—the Co-Creation Hub, or CcHub, which includes Facebook and Google as partners—was founded in Yaba.

Yaba had fewer than 10 start-ups in 2013; it now has close to 100 firms. It hosts digital labs for the First Bank of Nigeria Ltd. and Stanbic IBTC, which is a subsidiary of Africa's largest financial institution (Ackerman & Ibufan, 2019). In 2013, the government was persuaded to waive taxes for MainOne, the firm that installed Yaba's internet infrastructure. The government has since committed to developing Yaba further, taking a group of tech start-ups on a visit to Silicon Valley and buying 30,000 square miles of land to expand the Yaba tech cluster (Ibufan & Ackerman, 2019). Nigeria has 85 tech hubs whose goal is to foster partnerships, train developers, and create spillovers between firms.

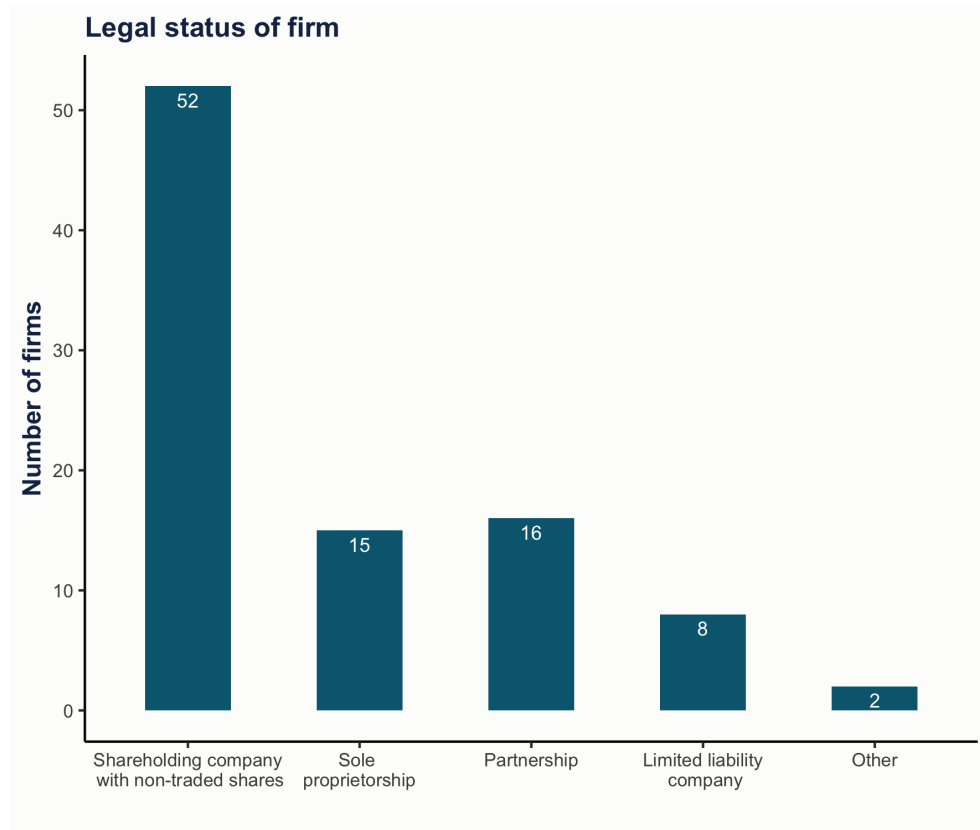
Over the past two years, 130 new tech hubs have opened across Africa (Adegoke, 2018). These often function like community centers with a steady supply of electricity and internet access but are expanding to provide training and to build a knowledge base. CcHub has launched a design lab in Kigali that will function as a research and development (R&D) center for tech firms across Africa. There is a pan-African network of around 158 hubs called AfriLabs, with deep knowledge of the local customer base and business environment. These types of networks have proven useful in Nigeria, Rwanda, Kenya, and across the African continent.

Legal status of firms

The Nigerian tech sector is dominated by firms in their first decade of operations. Firms mostly provide services in software, website and application development, and integration. Figure 2 shows

the legal status of surveyed firms. The majority of firms (52 percent) are shareholding companies with non-traded or privately traded shares. These firms are owned by individuals or by a closely knit group of associates; only a small percentage (16 percent) were a limited partnership or sole proprietorship (15 percent). The tech sector is also highly formalized, with only 1 percent of surveyed companies not registered with the Nigerian Corporate Affairs Commission.

Figure 2. Legal status of firms



Source: ONE-CGD Survey

Operations of surveyed firms are dominated by software provision, website and application development, and integration of tech solutions for the private and public sector. Consulting services include remote sensing, monitoring, solving business solutions, and creating platforms for sourcing professionals. E-commerce and retail platforms are also common. Consulting platforms integrating various services providing tech-based solutions to public and private sector firms are becoming increasingly popular. Table 1 shows the distribution of activities of the firms in our sample.

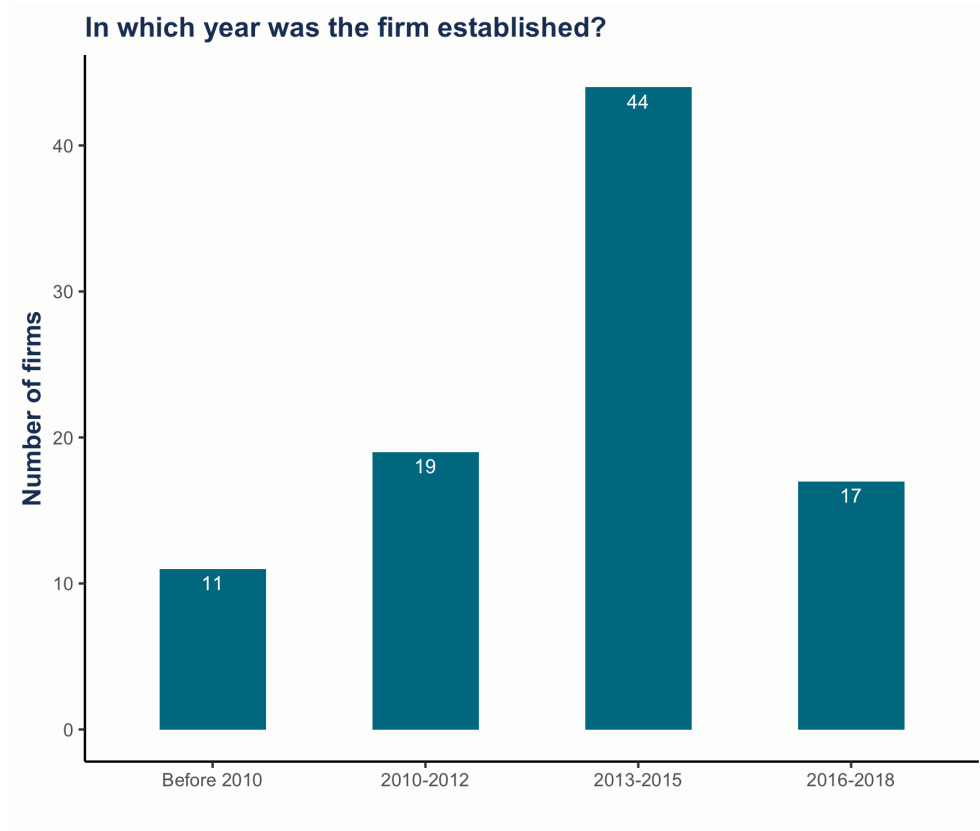
Table 1. Activities of Nigerian tech firms

Activity	Number of firms
Consulting	10
Digital marketing	4
E-commerce	6
Education	11
Enterprise systems	17
Finance	7
Retail	6
Software/Web development	7
Other	24

Note: Firms are often engaged in multiple activities. “Other” includes internet service providers, IT support firms and cyber cafes, as well as websites that provide legal advice, services for pets, etc.

Most of the growth in the tech sector occurred from 2013 to 2015, when there was an influx of venture capitalist funding for tech start-ups in Nigeria. Figure 3 shows the year of registration of surveyed firms.

Figure 3. Year of registration

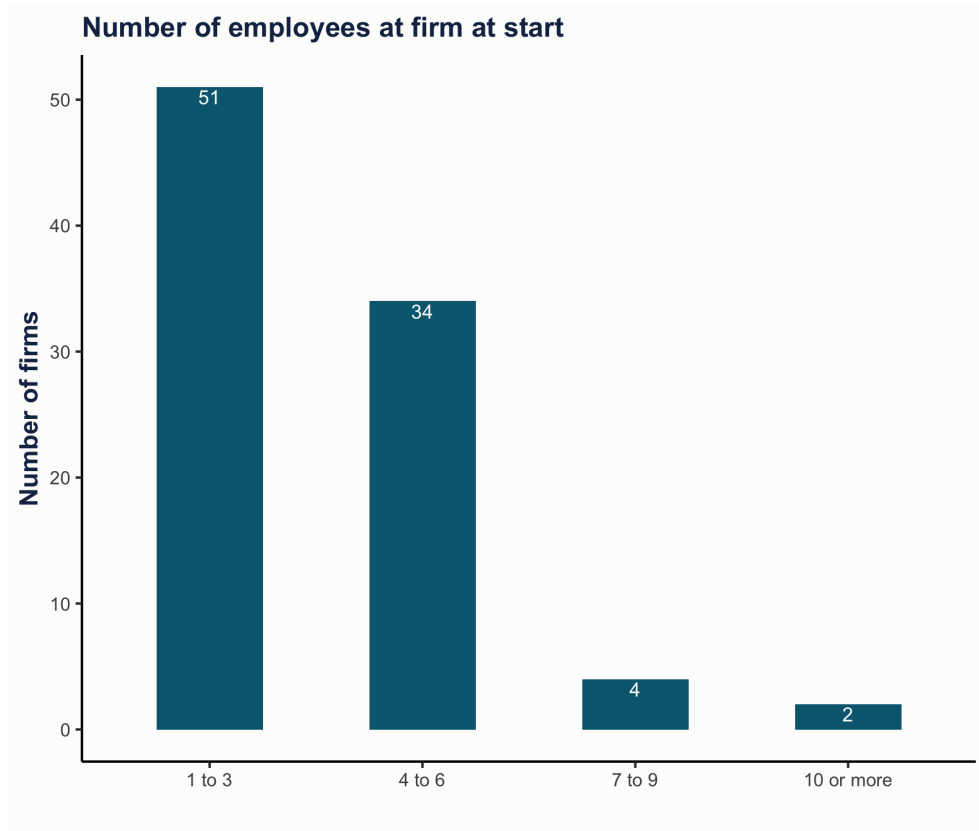


Source: ONE-CGD Survey

The potential for jobs

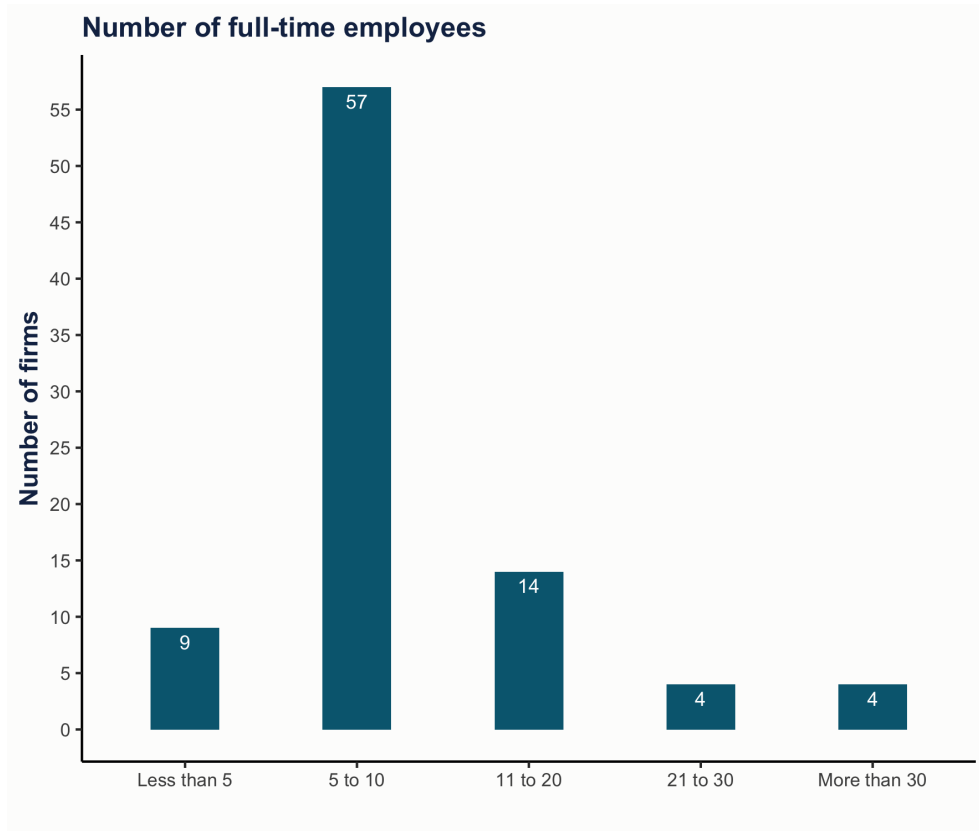
Nigeria's e-commerce leader Jumia employs about 3,000 workers across the region, and 100,000 more workers who help customers place orders (Adegoke, 2018). Similarly, Uber, which launched in the region in 2013, has created 7,000 jobs in the country (Ubabukoh, 2017). Despite the existence of some large tech firms in Nigeria, most firms that are domestically owned are still quite small. The median size at start in the survey sample was three full-time employees. However, we find that firms grew significantly, more than doubling in size to six full-time employees, between the start of operations and the time of survey. The median number of years of managerial experience is about 8.5; a quarter of managers have over 10 years of work experience. Figure 4 shows employment at start in the sample of firms surveyed in Nigeria, and Figure 5 shows the current size distribution. Figure 6 shows the number of years of managerial experience reported by managers.

Figure 4. Size at start of operations



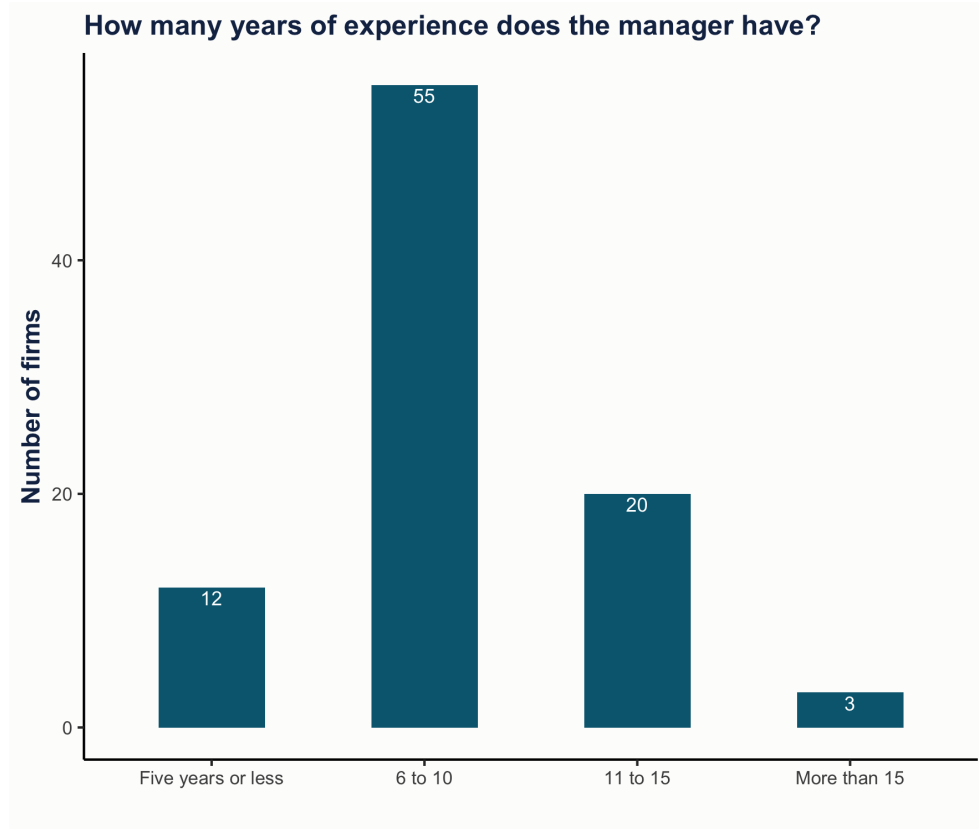
Source: ONE-CGD Survey

Figure 5. Current size of firms



Source: ONE-CGD Survey

Figure 6. Years of managerial experience

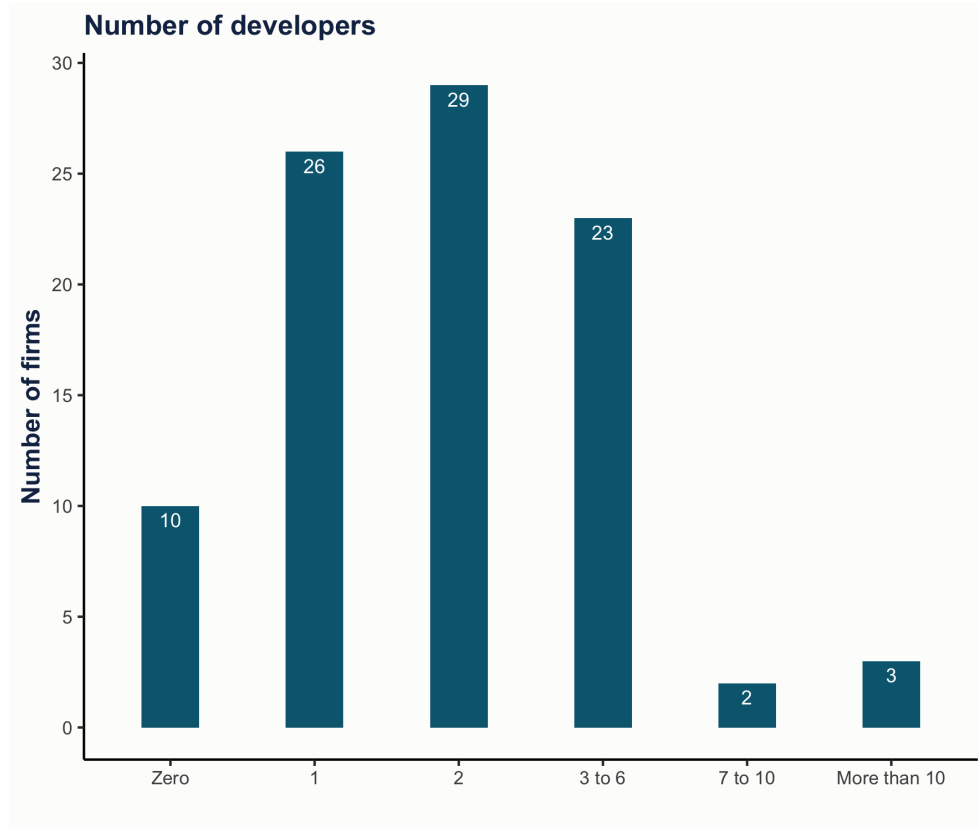


Source: ONE-CGD Survey

Figure 7 shows that most firms have only two full-time software developers; 11 percent of firms had no developers at all. The lack of software developers may be due to low wages and lack of career advancement opportunities as compared to firms in South Africa, Europe, and the United States (Kazeem, 2018). Tech entrepreneurs find it difficult to attract and retain good technical employees, as they must compete with established companies that can afford to pay more (OC&C Consulting, 2018).

Perhaps the most significant constraint facing the tech sector in Nigeria is a shortage of skilled developers. A report from OC&C Consulting finds that technical education has not evolved to reflect the needs of the market; many university computer degree programs teach outdated languages such as FORTRAN, whereas firms are looking for developers with experience in Java (OC&C Consulting, 2018). It goes on to say, “A recurring theme among the Nigerian tech entrepreneurship ecosystem stakeholders is that one of the largest challenges is the significant gap between what the education system can offer and what’s needed to support a thriving technology business.”

Figure 7. Number of software developers



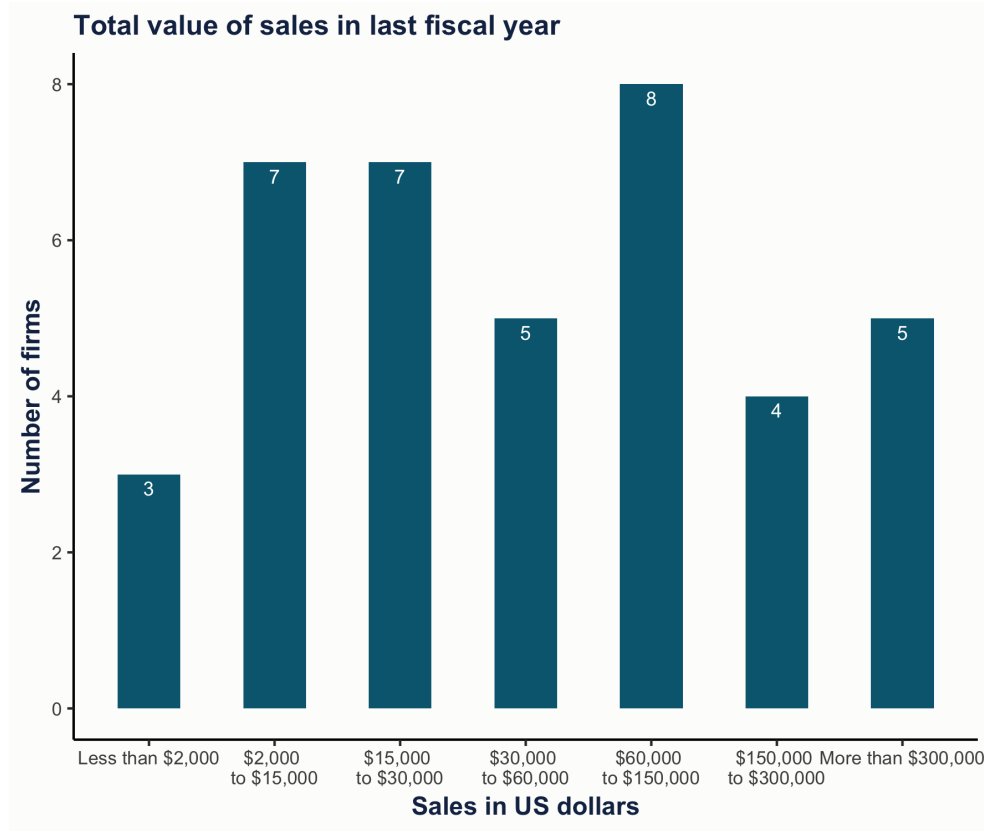
Source: ONE-CGD Survey

The availability of better remunerated jobs in other countries has also led high numbers of Nigerian developers to migrate in the last two years (Kazeem, 2018). This exodus of software developers is sometimes described as a crisis for the Nigerian tech industry. On the other hand, global tech companies such as Google and Facebook have launched tech hubs in Nigeria to train more local talent in software development (Kazeem, 2017). The Nigerian tech sector has also benefited from the proliferation of young developers and their eagerness to launch new products and services. According to the FreeCodeCamp, a free learning platform, Nigeria is its third most-represented country, with over 142,000 visitors.

Sales and customers

Median annual sales in the tech sector in Nigeria is about \$42,000, with a high degree of variation (Figure 8). A few firms record sales of over \$300,000, while some have sales of less than \$15,000. The latter figure is not surprising for the tech sector, where firms with a few employees often generate large revenues. Sales per worker run from less than \$1,000 to over \$30,000.

Figure 8. Total value of sales



Source: ONE-CGD Survey

Over 70 percent of tech firms surveyed focus solely on the domestic market. However, surveyed firms often have users of their products and services in other African countries as well as in other parts of the world. The United States and several countries in Western Europe were among the most referenced by surveyed firms. On the African continent, Ghana, Kenya, South Africa, and Tanzania were reported to be markets for Nigerian tech products and services. While big tech brands such as Jumia, CCHub, Andela, and Flutterwave have wide market reach across Africa, most tech firms in Nigeria are small scale businesses trying to keep their operations running despite infrastructure and regulatory challenges (described in the next section).

Business to customer (B2C) services are the focus of 73 percent of surveyed firms; only 27 percent provide business to business (B2B) solutions and services. Tech firms find it easier to enter the B2C market because of the low cost of acquiring customers through social media platforms. A large population of young people purchase services and goods on social media sites such as Instagram, Facebook, and WhatsApp. Jumia is an e-commerce site that provides pay-on-delivery services across Nigeria and is present in 14 other African countries. Despite the ease of building a clientele via social media, it has proved difficult for B2C businesses to scale in Nigeria. They are as yet unable to target customers who are willing to pay higher prices and/or purchase a larger volume of services or products.

The growing population of young people in Nigeria and across Africa means that demand for B2C tech products and services will continue to rise. As Nigerians move to cities (where about half the

population currently resides), shopping for goods and services will move from traditional locations such as open markets and stores to online stores. The combination of Nigerian population and urbanization dynamics means that there is scope for expanding B2C businesses.

A small share of firms provide B2B services. Government agencies and institutions constitute 53 percent of B2B clients for tech firms in this study. About half of the firms in our sample have a government contract; historically, this has been an avenue for growth for the tech sector. B2B activities include information technology (IT) consultancies, website design, and development and deployment of web platforms.

The Nigerian tech sector is rapidly growing: 58 percent of surveyed firms reported launching new products and services in the last fiscal year. Among these firms, 52 percent reported launching an improved or new variant of an existing product or service. For example, TBCA Nigeria, a tech-based consulting firm, recently created a web-based marketplace for experts and consulting firms. This transforms the traditional RFP (request for proposal) process and makes it accessible to a wider range of applicants. This service is expected to improve the procurement process for experts and technical assistance providers across Nigeria.

There is potential to expand B2B services within Nigeria and across Africa. There is a large underserved market in the informal and small business sector that can be supported by technology solutions. B2B tech solutions for informal and small and medium enterprises may help these firms to increase revenue, productivity, and employment, particularly for young people.

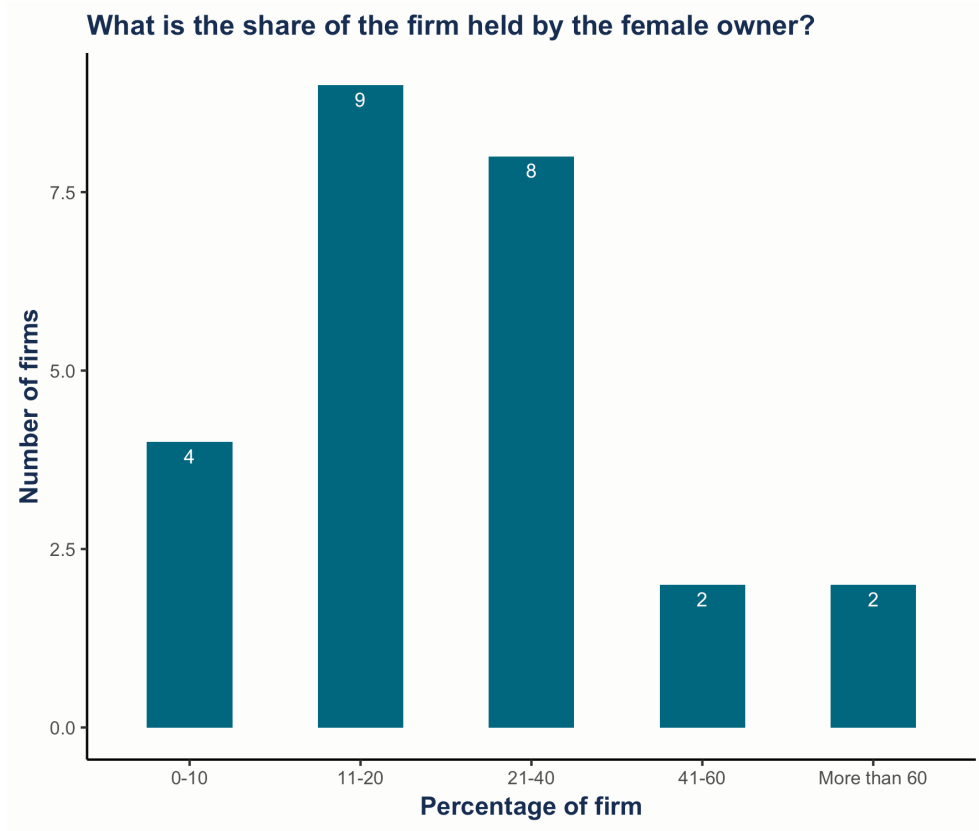
There is scope for further product development. Only 30 percent of surveyed firms reported R&D expenses in the last fiscal year. However, 41 percent of firms purchased new or used fixed assets such as machinery, vehicles, land, and buildings, and/or expanded existing structures in the past year.

Women-owned firms

The participation of women in the Nigerian tech sector is low. About 30 percent of the firms surveyed are owned by women. Women-owned businesses are mostly concentrated in e-commerce and enterprise solutions. Figure 9 shows the share of the firm owned by a woman; of women-owned firms, the median share of ownership is 20 percent. There are few women employed in tech firms—31 firms in our sample report employing no women at all. The median value is two female employees per firm (Figure 10).

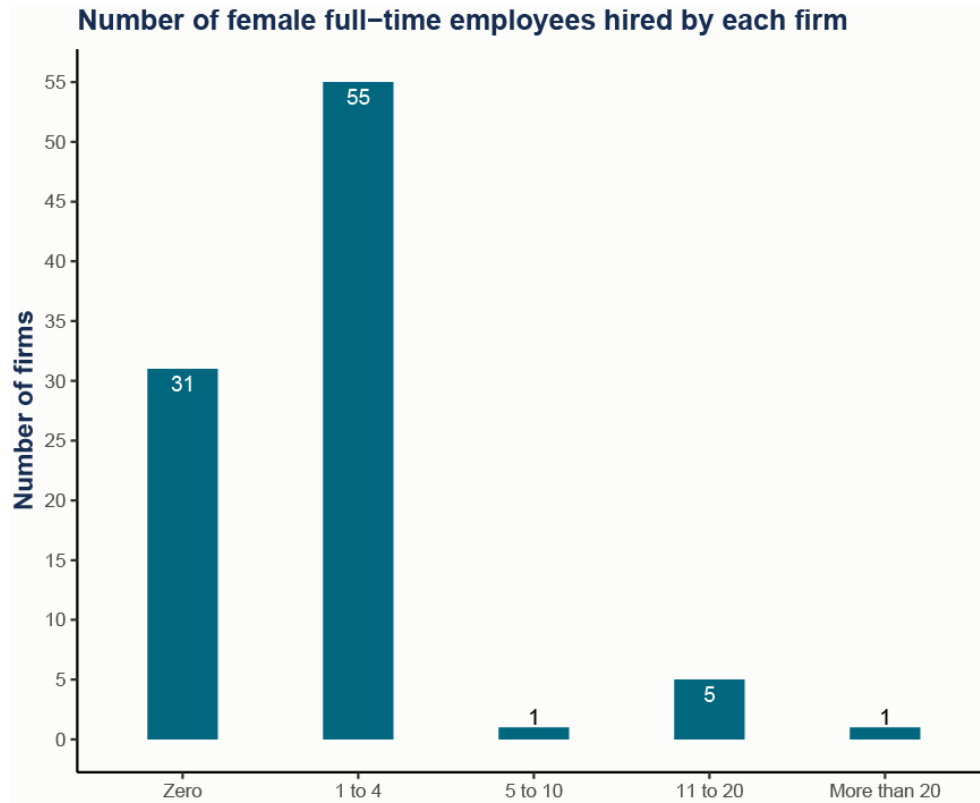
Male dominance in the tech sector is also revealed by the very small number of female top managers in the Nigerian tech industry. Of the 93 surveyed tech firms, only six had a woman in a top management position. It is estimated that women make up approximately 20 percent of the tech industry in Nigeria (Women's Technology Empowerment Centre, 2019).

Figure 9. Female ownership



Source: ONE-CGD Survey

Figure 10. Female employment

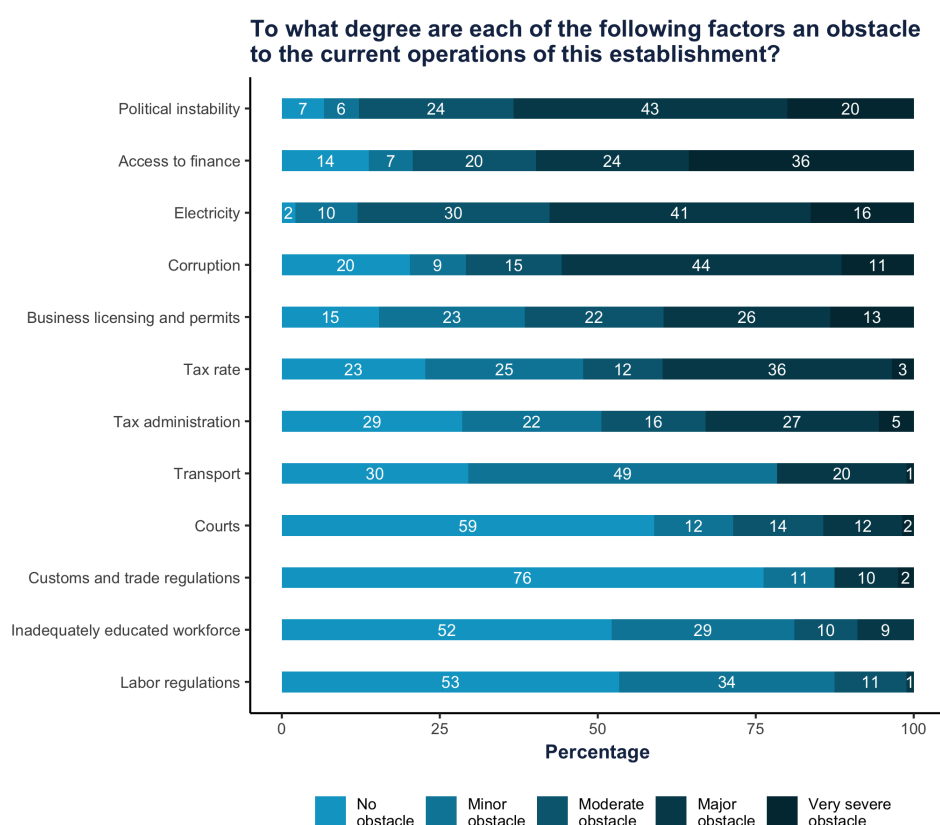


Source: ONE-CGD Survey

3. Back to Basics: Electricity and Access to Credit

Despite government and private sector investments in building tech infrastructure, Nigerian tech firms are very much constrained by the “basics” of the business environment. Access to a reliable source of electricity, access to finance, political instability, and corruption are the most severe constraints cited by tech firms. Other aspects of the business environment, such as taxes, tax administration, courts, and labor regulations, do not appear to be binding constraints, although they raise some concerns. In this section, we assess the business environment for Nigeria’s tech firms, comparing it to the business environment in the services sector in Nigeria as well as four other countries—Ghana, South Africa, Kenya, and Tanzania. Figure 11 shows the various constraints in the business environment for tech firms in Nigeria.

Figure 11. Business environment constraints



Source: ONE-CGD Survey; World Bank Enterprise Surveys

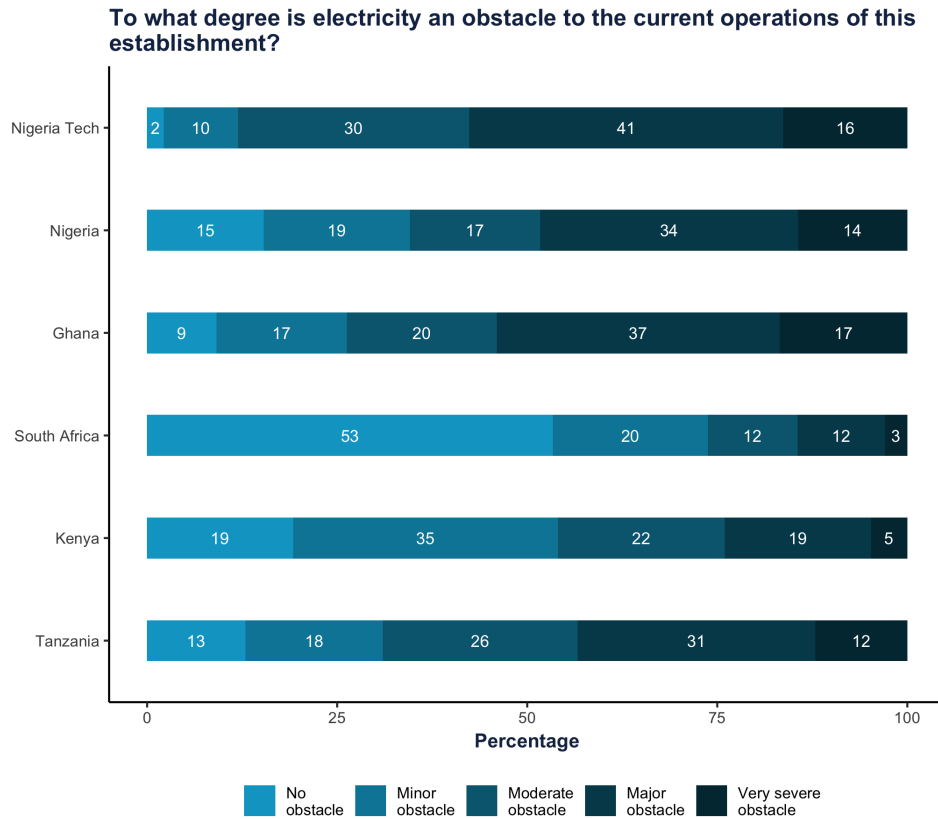
Power outages

Nigeria’s power sector does not provide an adequate amount of electricity for the country’s sectors, despite Nigeria being Africa’s largest oil producer and holding large reserves of coal and gas as well (Knoema.com, 2018). The country’s current installed capacity is reported to be 12,500 megawatts, but in practice it is only 3,200 megawatts (Akanonu, 2018). There are daily power outages in Lagos; most businesses consequently rely on diesel generators. For example, MTN, one of the largest mobile network operators in Africa, spends about 70 percent of its operating expenditures in the

country on generator fuel, with average monthly consumption in excess of 10 million liters (Oluwafemi, 2015). In fact, Africa’s largest oil producer spends four times more money subsidizing fuel than building new schools and health centers and equipping new science labs (Alake, 2019).

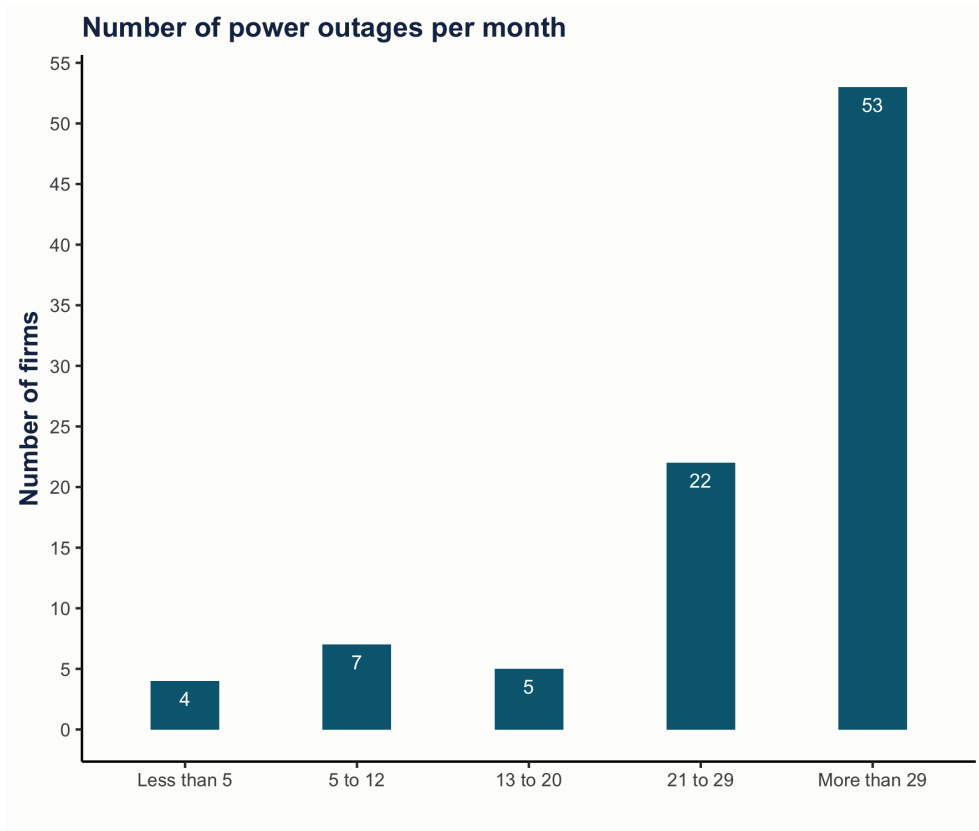
It is therefore not surprising that access to electricity is one of the most serious constraints facing tech firms in Nigeria; tech firms suffer even more than other firms. Of the surveyed firms, 57 percent say that it is a major or severe obstacle (Figure 12). Another 30 percent say that it is a moderate obstacle. These numbers are higher than those for the service sector overall; 48 percent of respondents in services ranked electricity as a major or severe constraint. Tech firms reported experiencing power outages almost 30 times in a month; each outage lasted about three hours on average (Figures 13 and 14). Power outages have decreased slightly since the deregulation of the power sector and emergence of independent power providers in 2012, but by no means has the problem been solved.

Figure 12. Access to electricity



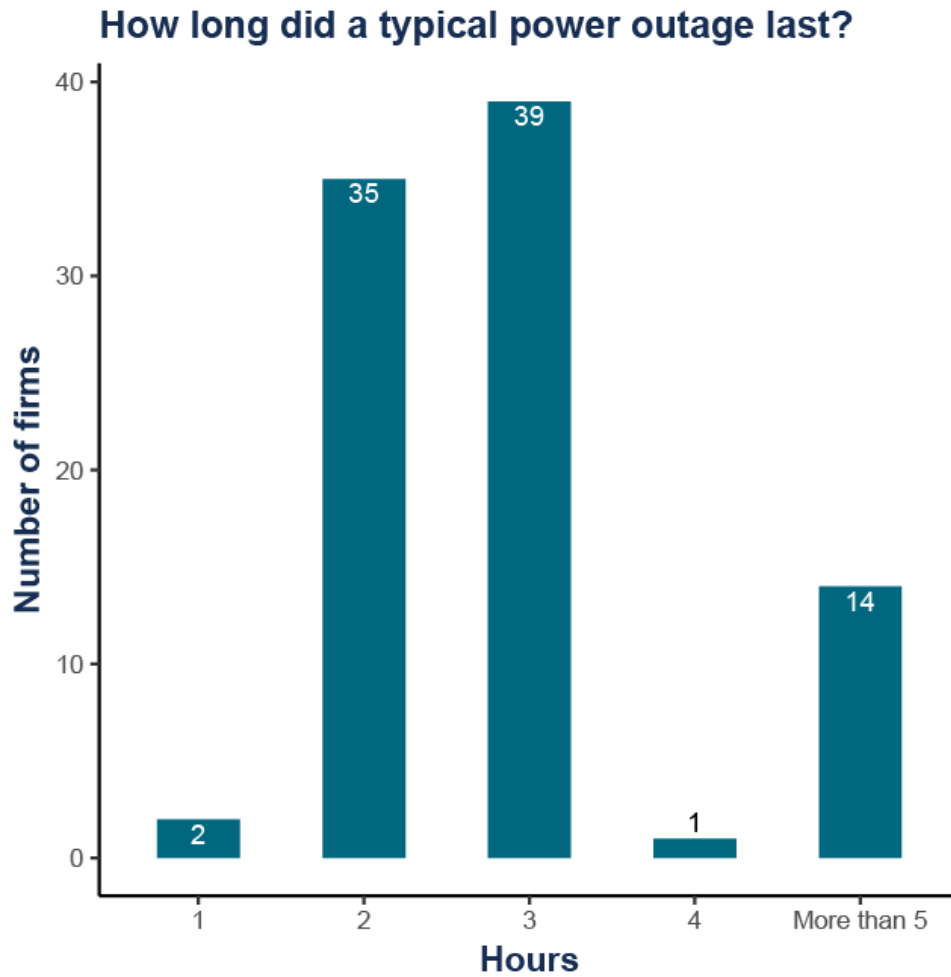
Source: ONE-CGD Survey; World Bank Enterprise Surveys

Figure 13. Average number of power outages



Source: ONE-CGD Survey

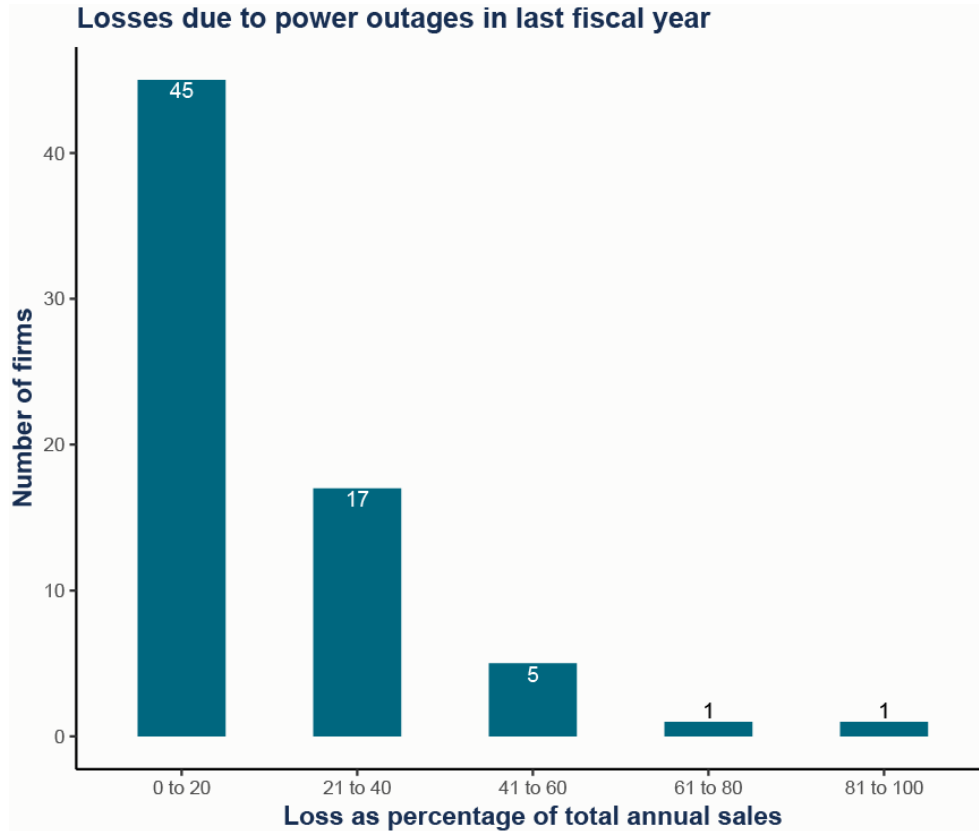
Figure 14. Length of power outage



Source: ONE-CGD Survey

Revenue losses due to power outages are significant. Median losses are as high as 20 percent of sales for surveyed firms. Figure 15 shows that 45 firms in the sample report losses of up to 20 percent, and another 17 firms report losses of 21 to 40 percent of sales. Over 90 percent of surveyed firms either own or share a generator but this is an expensive and insufficient way to offset losses due to power outages. Inefficiencies in the power sector in Nigeria are estimated to result in annual losses of 534 billion naira or \$1.5 billion (Ejoh, 2017).

Figure 15. Losses due to power outages



Source: ONE-CGD Survey

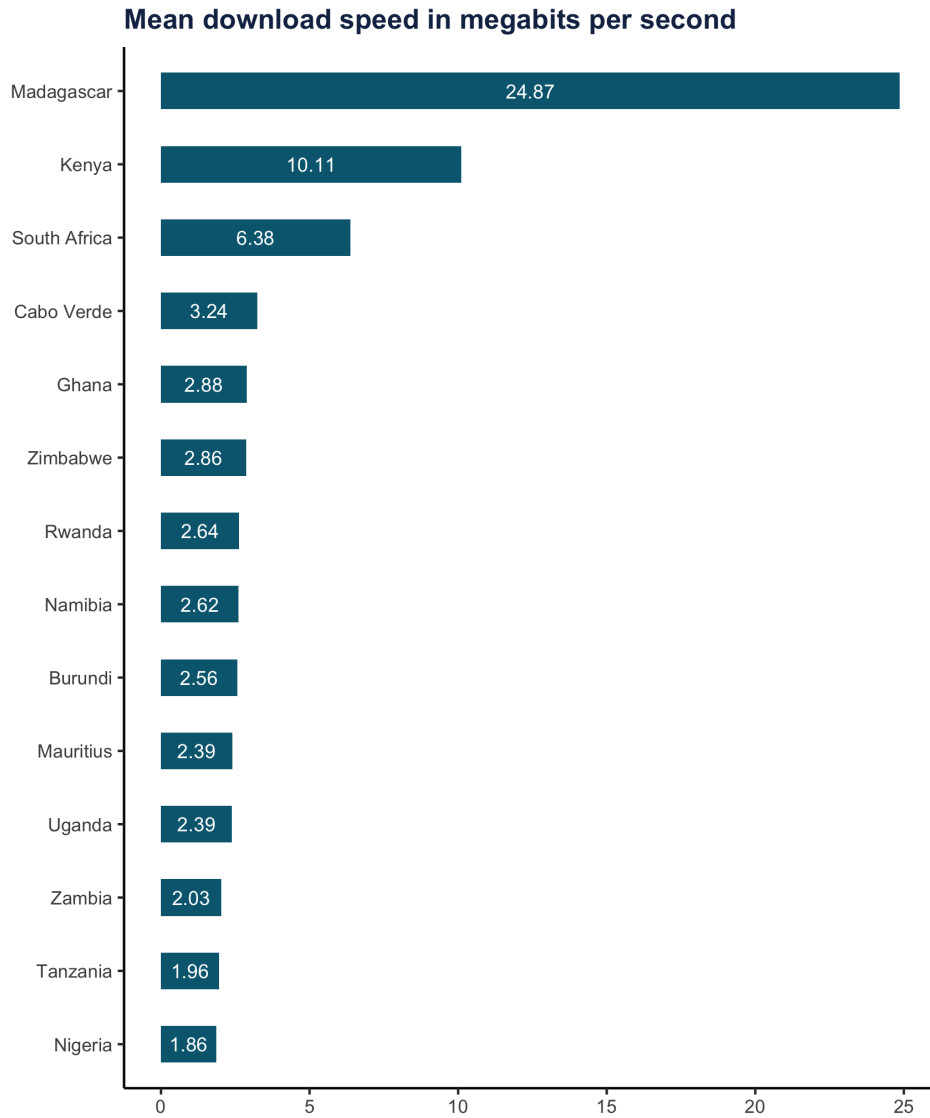
Access to quality broadband internet

Access to reliable internet service is also a significant constraint to the technology sector in Nigeria. Despite having the largest number of online users in Africa, internet quality in the country remains poor. The increase in internet penetration in Nigeria is due to the growth in mobile data users rather than broadband services. Although mobile data works well for individual users, it cannot effectively serve large organizations, like schools, businesses, and government agencies, which require a large number of people to be online at the same time.

There are two reasons why the quality of broadband remains low (Figure 16). One is underdeveloped digital infrastructure—of the 120,000km of fiber-optic cable that the country requires for effective broadband coverage, only 38,000km has been deployed (Osugwu & Uzor, 2018). This is largely down to inflated costs due to government surcharges on laying cables and expensive inputs. The lack of cable coverage means that Nigeria only uses between 10 to 20 percent of the total bandwidth available through international cables; many consumers cannot get a broadband connection installed even if they wish to (The Economist Intelligence Unit, 2016). The second is the additional cost imposed by power cuts on internet service providers, which results in slow internet connections.

Nigeria ranks 152nd in the world when it comes to broadband speed and 15th in Africa (Cable, 2019). Although mobile data speeds have increased significantly, more investment is needed in the broadband sector.

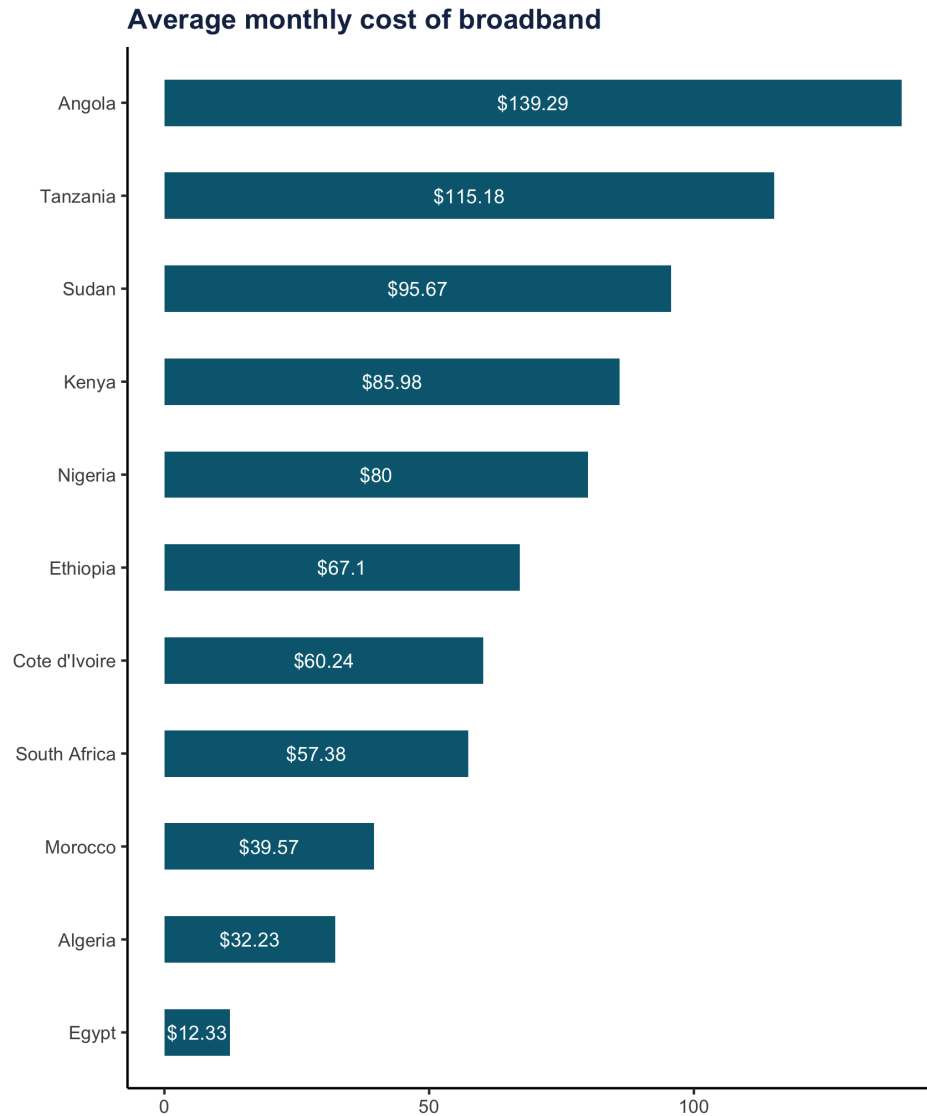
Figure 16. Download speeds in Africa



Source: Quartz ATLAS; data from Broadband Speed League by cable.uk

Broadband internet is also prohibitively expensive (Figure 17). The average cost of a monthly broadband connection is \$80—almost double the national minimum wage of \$50 (Kazeem, 2017). Slow internet speeds coupled with high costs represent a challenge to tech sector firms operating in Nigeria.

Figure 17. Average monthly cost of broadband



Source: Quartz ATLAS with data from Broadband Price League by cable.uk

Lack of credit

Access to finance is a significant constraint for small businesses in Nigeria. Because of the difficulty in assessing and managing risks associated with credit, banks are often reluctant to lend to small enterprises. This reluctance has translated into stringent screening measures and requirements by banks, which, in turn, discourage small and medium enterprises from applying. Lack of adequate collateral and difficult application procedures are often cited as major constraints for Nigerian firms when seeking to obtain loans (IFC, 2017).

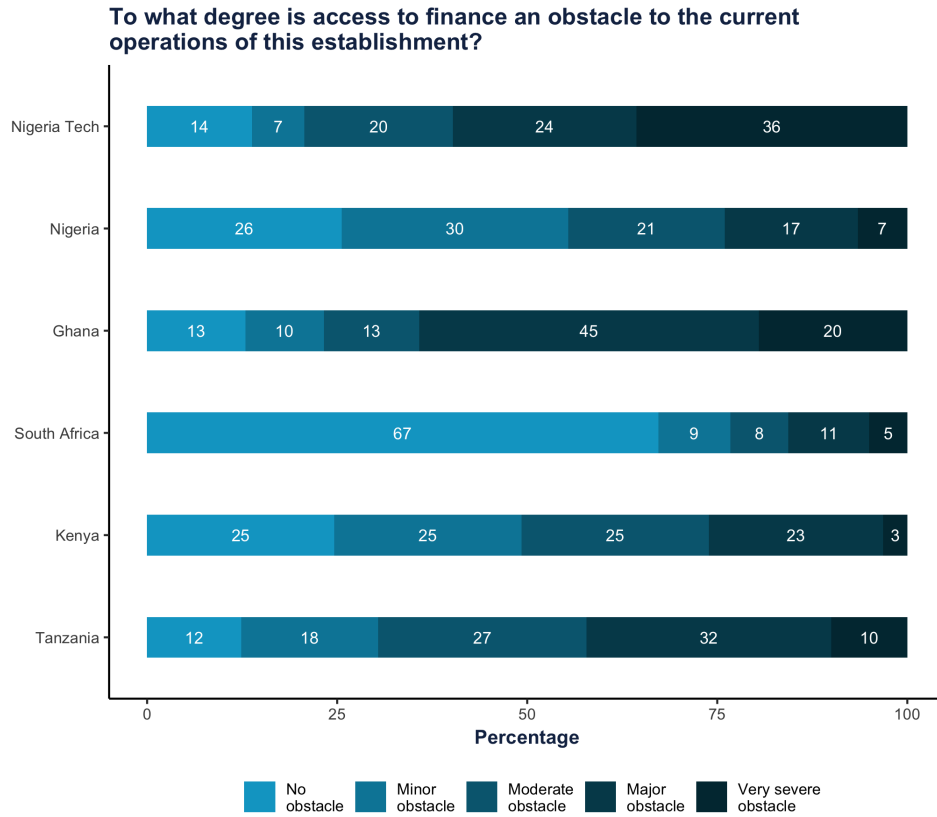
In our sample of firms, about 60 percent report that access to credit is a major or severe obstacle (Figure 18). Respondents say they face a significant challenge in sourcing financial support to

maintain or expand their operations. They also express concerns regarding the lack of access to domestic investors and venture capitalists. Currently, only a small number of private and public sector early investor and venture capitalists provide financing for tech firms; most of these are located in Europe or in Silicon Valley. For example, LeadPath Nigeria provides seed capital ranging from \$25,000 to \$100,000. Nigerian tech firms have yet to see significant investments from domestic investors (Rotinwa, 2019).

International investors favor foreign-trained entrepreneurs, leaving homegrown firms at a disadvantage. This is best illustrated by the case of RenSource and Arnergy, two renewable energy firms that offer similar products. RenSource was founded by a German-based Nigerian who studied abroad and worked in both the United States and the United Kingdom. Over three funding rounds, his company has raised \$5.2 million (Rotinwa, 2019). Arnergy, on the other hand, was founded by Nigerians with local experience. Despite being lauded for their innovations and having existed for a year longer than RenSource, they have only been able to raise \$146,000 (Rotinwa, 2019).

Female founders of start-ups are less likely to secure funding in comparison to their male counterparts. Odunayo Eweniyi, one of the founders of the fintech start-up PiggyBank, found that “local investors related better with men” when her company tried to raise money. She decided to stop attending investment meetings, leaving her two male co-founders to secure funding for the company. Chika Nwobi of L5 Labs, a local venture capital fund, citing cultural restraints, admitted: “I am unlikely to mentor a female tech entrepreneur because I am married.” He explained that cultural beliefs stopped him from developing a close but professional relationship with female tech entrepreneurs because it could be easily misinterpreted (Rotinwa, 2019). A female founder of a leading tech organization told us that negative stereotypes associated with female programmers are leading to fewer women entering the tech sector.

Figure 18. Access to finance

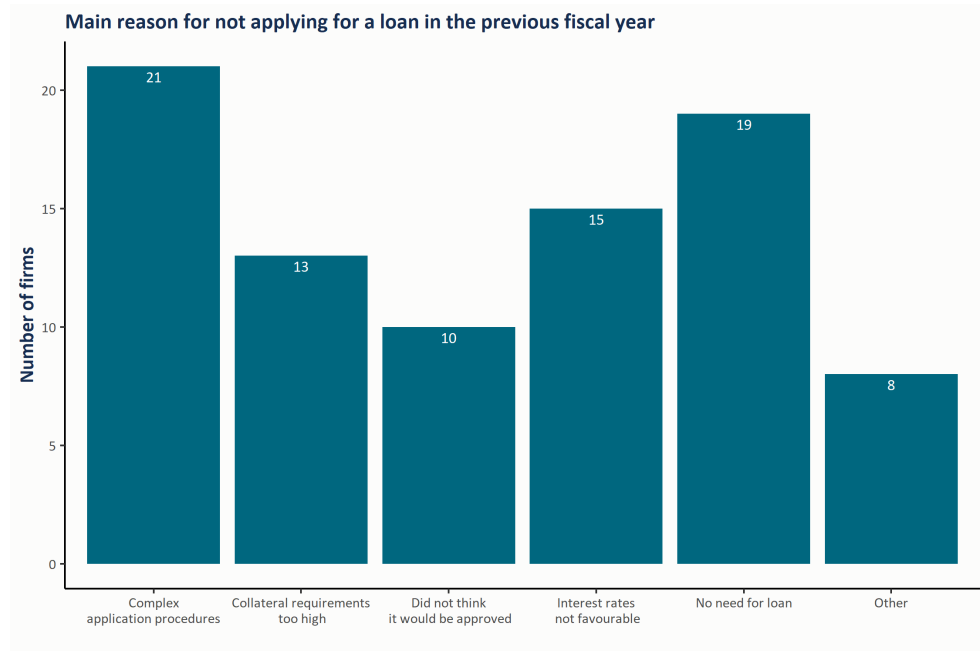


Source: ONE-CGD Survey

New sources of funding are available, but mostly for larger firms. Tech firms such as Flutterwave, Releaf, and Helium Health have been funded by Y-Combinator, a US-based accelerator programs for start-ups. The Venture Platform is an early-growth-stage funding group focused on tech firms that have launched a minimum viable product. The Lagos State government recently launched the Lagos Innovates program, an initiative aimed at supporting technology start-ups. The Lagos Innovates program provides access to workspaces, sponsorships for tech events, and funding for the establishment of technology hubs. Respondents to our survey indicated that tech start-ups have easier access to financing from public sector-led programs than from accelerators or venture capitalists. Only 9 percent of respondents have received grants from accelerator programs. The funding sources mentioned by respondents include the YouWin program of the Federal Ministry of Finance, the Lagos State Employment Trust Fund, Lagos MEST, and Seedspace.

Financing is limited; of the 93 firms surveyed, only three received any support from a financial institution in the past fiscal year. A larger number of firms reported receiving financial support from individuals in their social or professional networks. Of the 42 firms that responded to a question regarding the outcome of their loan application, 10 firms said that their applications were approved while six said they had partial approvals. The most cited reason for not applying was complex application procedures (Figure 19). Financial institutions appear to view tech start-ups as high-risk ventures, while tech firms seem reluctant to engage with the financial sector; it is worth noting that 19 firms say that they have no need for a loan even though they were expanding their operations.

Figure 19. Reason for not applying for a loan

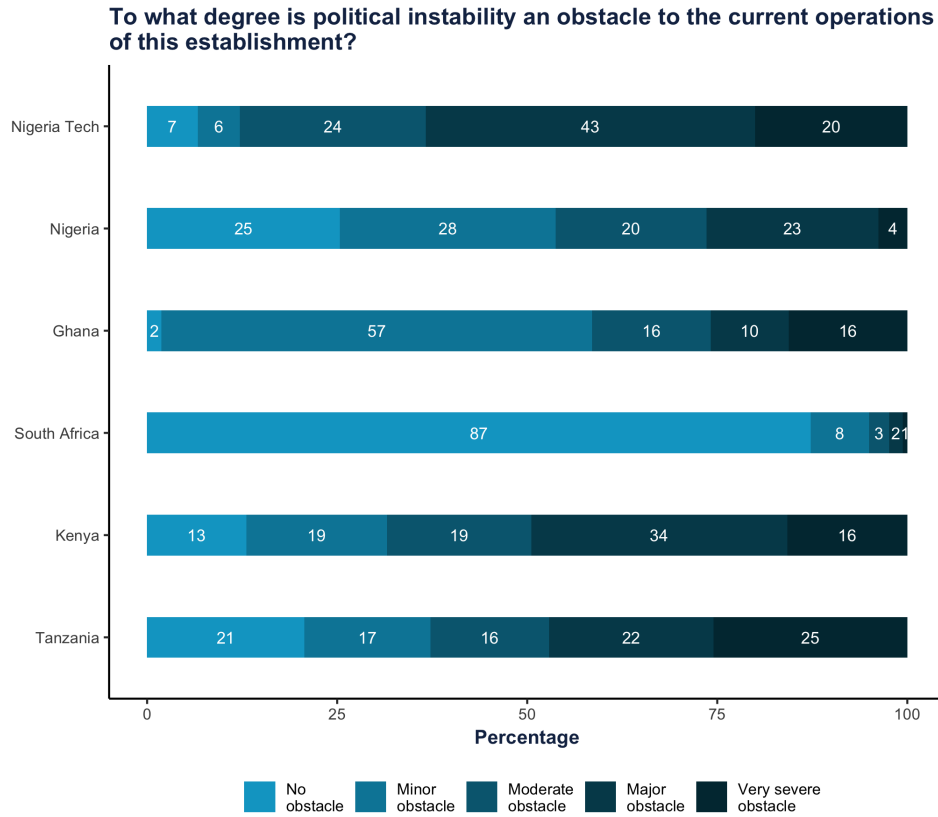


Source: ONE-CGD Survey

Political instability and corruption

The lack of political stability in Nigeria is a concern for tech firms. This is a longstanding problem: several assessments of the business climate over the years have highlighted the impacts of various regional conflicts on firms' productivity and sales. Mostly, it manifests as concerns about violent conflict and lack of security. It appears that the tech sector is not immune from this set of problems.

Figure 20. Political instability

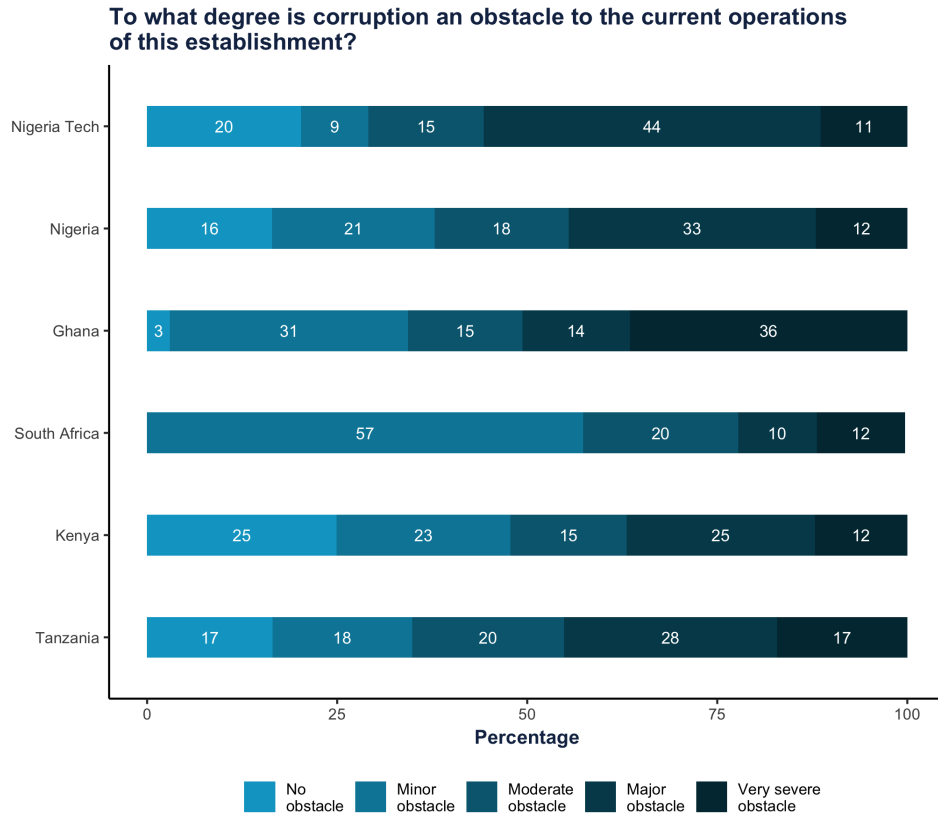


Source: ONE-CGD Survey; World Bank Enterprise Surveys

Incidence of violent conflict and other types of security challenges arising from political instability have also had a significant effect on the tech sector. Tech firms have voiced concerns about violent attacks, theft, burglary, and kidnapping, as well as police harassment of young people seen with laptops (Specialist, 2019). Increasing security challenges across Nigeria will limit gains from the tech sector, despite new investment in boosting technology education and infrastructure. This concern is also evidenced in our survey—63 percent of firms consider political instability to be a major or severe obstacle to their business while another 24 percent rate it as a moderate obstacle.

Related to this, firms also complain about corruption. Figure 21 shows that 55 percent of firms in the sample view corruption as a major or severe obstacle to doing business. This number is higher than for the services sector as a whole and higher than most other countries. However, only 4 percent of surveyed firms reported paying a bribe or giving an informal gift to tax officials when asked directly by the survey. It seems as if corruption is a hinderance to business, but most firms are reluctant to admit to paying a bribe.

Figure 21. Corruption

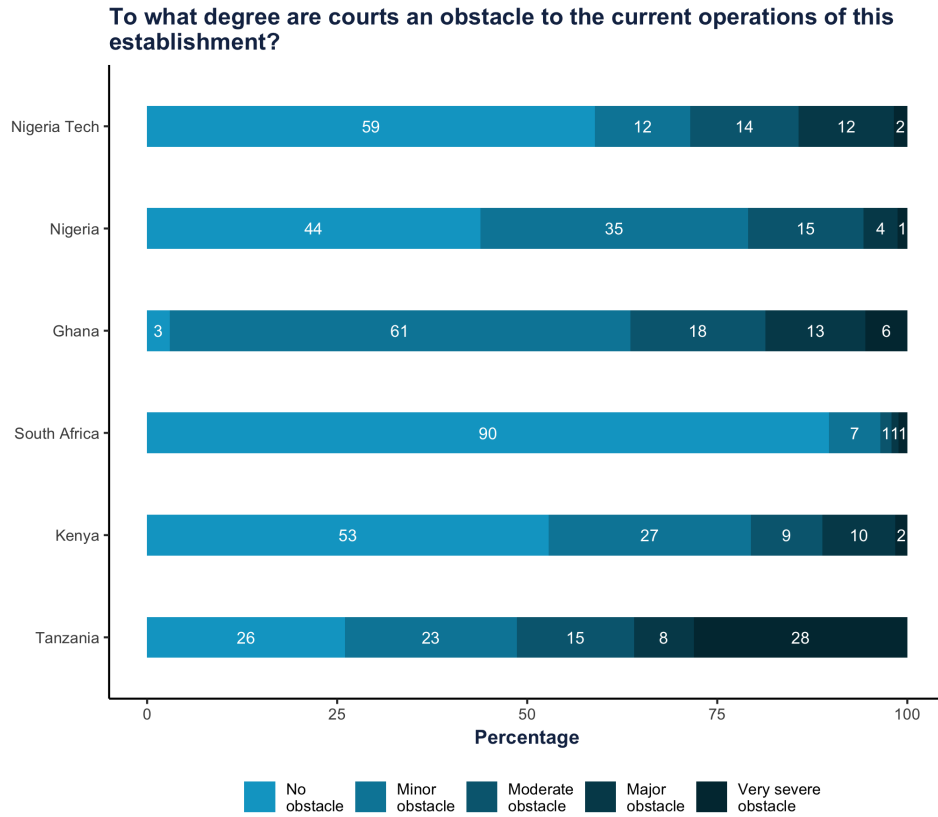


Source: ONE-CGD Survey

Courts and taxes

Tech firms are somewhat wary of the courts even though they do not consider them a major or severe obstacle to doing business (Figure 22). Some firms do not perceive courts as fair arbiters of contract or trade disputes—about 14 percent say that courts are a major or severe constraint, another 14 percent say they are a moderate obstacle. These numbers are low, even in comparative perspective. However, starting a business is costly. The World Bank Doing Business Index 2019 estimates that it takes an average of 447 days and costs 42 percent of the claim value to enforce a contract or resolve a commercial dispute in Nigeria (World Bank, 2019); these costs are high but firms in our survey appear more constrained by the lack of access to electricity and finance.

Figure 22. Courts



Source: ONE-CGD Survey

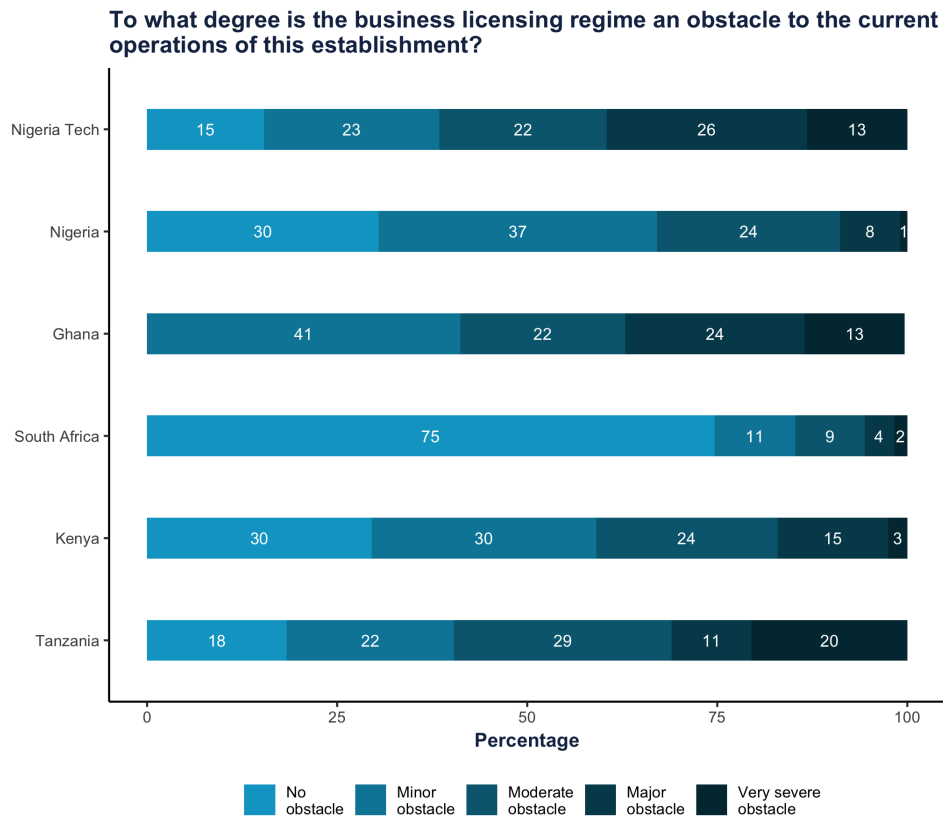
In the Nigerian tech sector, the regulatory agency for the enforcement of contracts and resolution of commercial disputes is the National Office for Technology Acquisition and Promotion (NOTAP). This agency requires the registration of contracts, including foreign technology transfer agreements, between a Nigerian resident or business and a foreign business or individual. Non-registration with NOTAP will invalidate any payment agreement by the Nigerian resident individual or business by a Nigerian bank in the event of a dispute. As of now, most firms in the tech sector do not deal much with NOTAP; their operations are still quite limited, and they mostly rely on financing from family and friends.

Nigerian regulations lag in addressing digital challenges. Tech start-ups are relatively new, and authorities are often not familiar enough with their operations to design and implement the necessary regulations (OC&C Consulting, 2018). A recent survey of fintech managers revealed that most felt the government wished to help but needed to better understand the tech environment in Nigeria and create laws accordingly (Deloitte, 2019). The vice president of Mines, a digital credit company, observed that

we could improve education on the ramifications of regulation. For instance, in other countries, there has been much talk about data privacy. However, it is critical to understand that the context that drives the conversations in the developed world is different from that of the emerging world. It is important to understand that there are positive benefits to data sharing especially in markets that lack infrastructure. For companies like Mines with a mandate to create access to money everywhere for everyone, it is imperative that regulation promotes data sharing among approved companies, in a manner that suits our environment. (Deloitte, 2019)

One procedure that is not too onerous is that of obtaining a business license (Figure 23). Almost every senior manager of surveyed firms reported that they spend only about 1-2 hours a month dealing with regulatory issues. However, there are variations in the quality of the business environment across the 36 states and the federal capital, Abuja. According to the World Bank's Doing Business Index, starting a business takes eight procedures and over 10 days of processing, costing about 27.6 percent of income per capita (\$5,6780) in Nigeria (World Bank, 2019). Starting a business in Abuja takes seven procedures and 10 days of processing, costing 25 percent of income per capita. According to Doing Business estimates, Abuja is the easiest city in Nigeria in which to start a business.

Figure 23. Business licensing regime

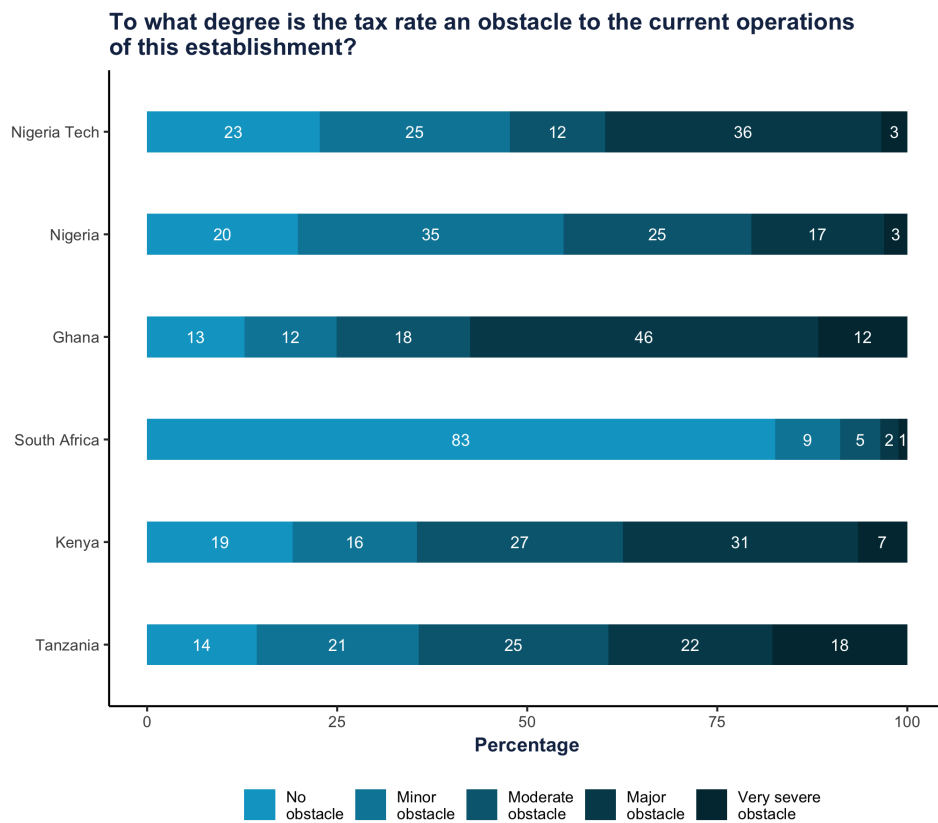


Source: ONE-CGD Survey

The Doing Business Index also reports that the cost of business premises registration is the most expensive part of starting a business in Nigeria. It is lowest in Kebbi and Zamfara states (North Western Nigeria) at \$9 and highest in Gombe (North Western Nigeria) at \$455. The state with the highest cost of business premises registration—Gombe—is also one of the poorest states in Nigeria (Ochelle, 2015). Gombe aspires to become a major tech hub in Northern Nigeria with the recent launch of the University of Science and Technology.

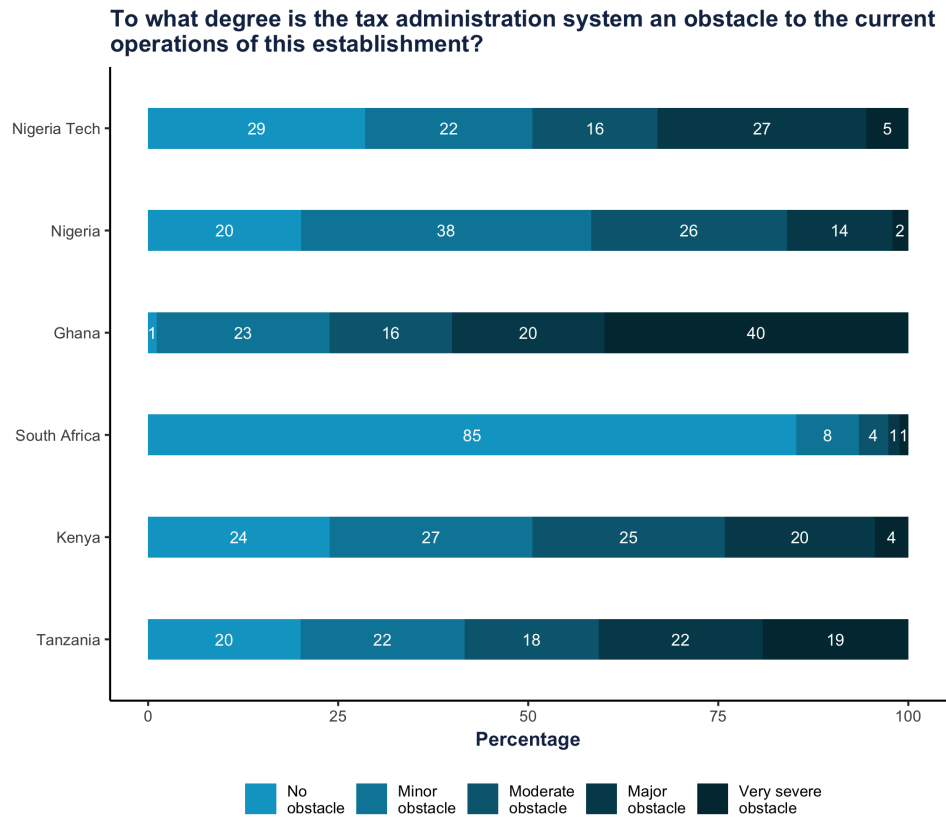
Figures 24 and 25 show that tax rates and tax administration can be improved, although these are not as problematic in Nigeria as in East Africa. The Nigerian tax system is hard to navigate for entrepreneurs and it is not designed to include incentives or reliefs for small enterprises. About 11 percent of firms consider the tax rate as a major or severe obstacle to business operations; another 44 percent rate it as a moderate obstacle. Some firms reported being subjected to arbitrary taxes and fees by multiple agencies across local, state, and federal levels of government; some argue that small businesses such as tech firms carry most of the tax burden in Nigeria. Levies include federal taxes on awarded and received contracts and land use charges by state governments. Over half of surveyed firms reported paying taxes at the local and state level without having a formal inspection of their financial records by any tax authority.

Figure 24. Tax rates



Source: ONE-CGD Survey

Figure 25. Tax administration

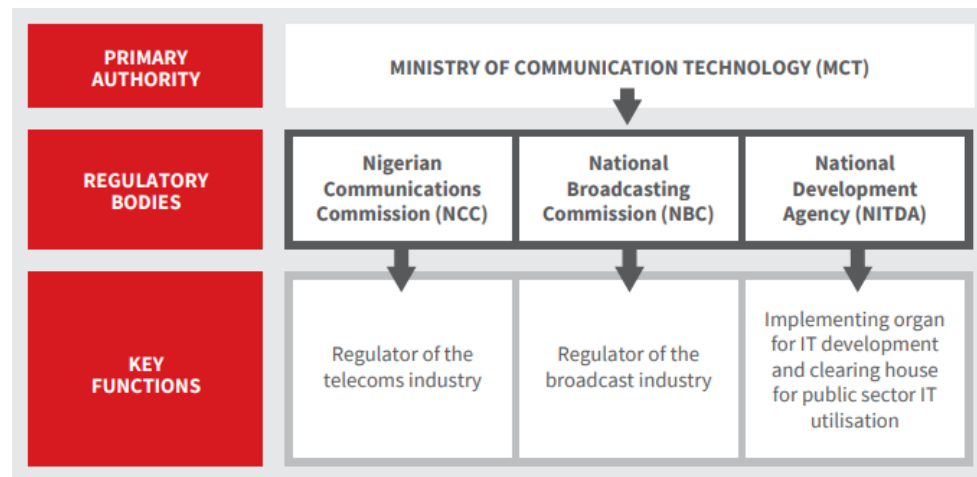


Source: ONE-CGD Survey

4. Current Policies

The National Information Technology Development Agency (NITDA) Act of 2007 mandates NITDA as the agency responsible for creating a framework for the planning, research, development, standardization, application, and coordination of information technology (ICT) practices, activities, and systems in Nigeria. NITDA is also mandated to introduce appropriate regulatory policies and incentives to motivate private sector investment in the ICT sector, among other responsibilities. In pursuance of its mandate, NITDA has developed a number of policies and frameworks for the Nigerian ICT sector, which also apply to the tech industry.

Figure 26. Current framework for ICT regulation in Nigeria



Source: Odufuwa 2012

The National ICT Policy of 2012 describes the aspirations of the government to “leverage ICT in addressing youth-specific development and orientation issues.” The 2012 policy advocates the use of ICT in partnership with youth-focused bodies and relevant government agencies to deliver information on national unity and ethical values, encourage the positive use of ICT by youth, and promote incentives and support schemes targeted at youth entrepreneurship.

In addition, the National ICT Policy aims to (Section 7.15.3)

- provide incentives such as appropriate tax and import duty reliefs;
- facilitate the grant for pioneer status to qualified companies to encourage investment in the ICT sector;
- provide appropriate fiscal incentives to encourage local manufacture of ICT equipment and development of software;
- streamline procedures and requirements for the importation of ICT equipment;
- in collaboration with relevant agencies of government, take practical steps to reduce the occurrence of multiple regulation and taxation in ICT;

- adopt financing models that foster indigenous ICT entrepreneurship.

The National ICT policy demonstrates that the Nigerian government sees the tech sector as a priority. However, it needs an implementation framework for the policy's objectives. And some of the government's programs need to be designed better. iDEA Hub—a federal government-funded technology incubation center in Yaba—provided coworking spaces for entrepreneurs, accelerator and incubator funding for start-ups, and technical trainings. In its first five years of operations, iDEA Hub was reported to have trained over 1,500 individuals and raised over \$800,000 in funding (Ekwealor, 2017). In March 2017, iDEA Hub announced the closure of its multistory training and incubation center in Yaba and relocated elsewhere in the city. This turned out to be its downfall—operations at iDEA Hub have since ceased.

More recently, the Nigerian government has included tech firms in new guidelines for application of “pioneer status” by the Nigerian Investment Promotion Council. Benefits of pioneer status include a three-year tax holiday with a possible extension for up to two years, as well as exemption from the deduction of a statutory 10 percent withholding tax from dividends to shareholders.

However, under the Pioneer Status Incentive Regulation (PSIR) (Nigerian Investment Promotion Commission, 2014), tech firms are required to show non-current tangible assets of at least 100 million naira (Federal Ministry of Industry, Trade and Investment, 2017). This policy applies equally to domestic tech companies, thereby forcing tech start-ups to compete with established international brands and larger industries. While the absence of special provisions for domestic tech firms may be useful from a competitiveness point of view, it may also exclude young tech entrepreneurs who do not have the financial resources to qualify under PSIR.

Furthermore, the language around the definition of obligations has been criticized as vague and leading to misinterpretation and miscommunication in the entrepreneurship community, resulting in underutilization of this incentive by start-ups. There are currently no policies to incentivize angel investors to invest in tech entrepreneurship. Capital gain tax exemptions for early-stage investments in start-ups for investors and VCs are perceived as good incentives.

Tech firms are also liable for taxes and levies prescribed under the NITDA Act (2007). Section 12(2) of the Act identifies firms liable for an information and communication tax, including “cyber companies and internet providers,” a term that would apply to most tech firms in Nigeria. Tech firms are also taxed under the Companies Income Tax Act (1961), as well as at the state and local government levels on signage, advertisement, and land use, as well as radio and television licensing fees. There is no local financing product from commercial banks or the Nigerian Bank of Industry targeted specifically at the tech sector. Thus, the tax burden is heavy, especially for small firms.

In 2016, the Nigerian government launched the ICT Sector Roadmap (2016-2019) to address key challenges facing the sector. The roadmap focuses on improving technology infrastructure, expanding broadband penetration, and supporting e-commerce. To facilitate mobile broadband service, the Nigerian Communications Commission has auctioned 2.6 GHz spectrum to a private commercial company (MTN Telecommunications) in a push to increase 3G network penetration to reach 90 percent of the population.

Given the problems with current tech sector policies, the Nigerian government should undertake three reviews. First, it should review the National ICT Policy to Include Implementation Strategies on Leveraging Technology for Youth Employment. In its current draft, the policy does not include

strategies or modalities for NITDA's engagement with the private sector on youth engagement or its support for small-scale tech enterprises.

Second, it should review the PSIR Status Capital Requirements for Domestic Tech Firms in Nigeria. While the inclusion of tech firms in the PSIR is a step in the right direction, the capital requirement will likely exclude a majority of tech firms. It will be useful for the government to review this policy and to devise a more reasonable set of requirements.

Third, the Nigerian government should reform its tax policy. Tech firms operating at the state level should be excluded from local government levies as their operations supports businesses as well as the government's engagement with citizens. Also, state governments might consider a provision whereby tech start-ups pay a lower rate for business premises registration or land use permits.

5. Recommendations

Of the various constraints highlighted in this analysis, we focus on three—electricity, finance, and women’s participation in the tech sector.

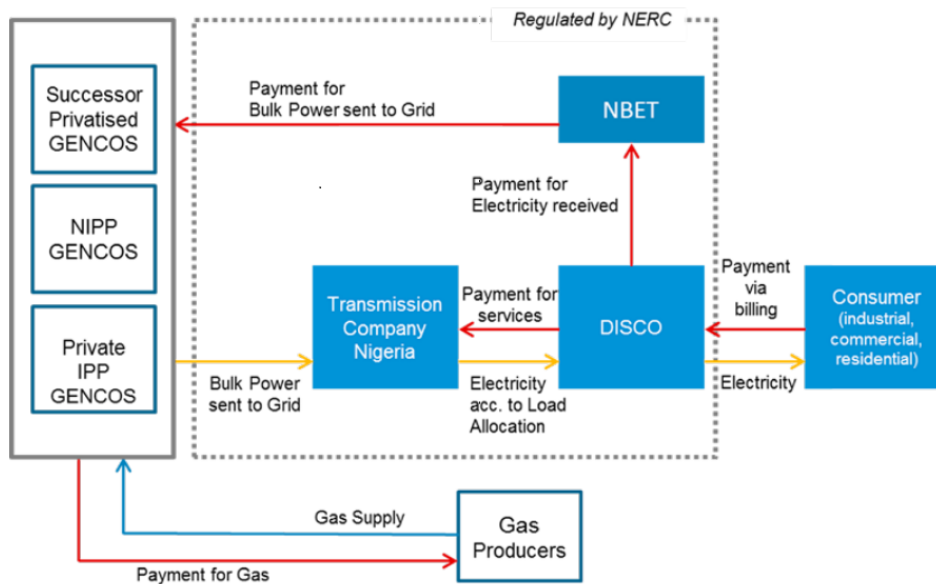
Electricity

The ONE-CGD survey shows that one of the most significant concern of tech firms is **access to electricity**. The lack of a reliable source of power is a longstanding problem in Nigeria. The country has struggled with fundamental infrastructure problems that overshadow most of the initiatives undertaken to foster tech entrepreneurship. Reliable, continuous power supply is an ongoing concern for most African nations.

Nigeria has about 13GigaWatt (GW) of electricity generating capacity, a transmission capacity of 5GW, and distribution that hovers between 3.5 and 4.2GW (PwC, 2016). This output is well short of the country’s needs, and as a result 80 million people in Nigeria are off the grid (Akwagiyaram & Carsten, 2018).

In 2013, the government tried to privatize the power sector in order to improve efficiency and increase access to private capital. This involved the unbundling of the Power Holding Company of Nigeria (PHCN) and privatization of the power generation companies (GENCOs) and distribution companies (DISCOs). Under the new system, the government-owned Nigerian Bulk Electricity Trading company (NBET) buys power from generators and passes it on to distributors who then collect money from customers and reimburse NBET. The sector is overseen by the Nigerian Electricity Regulatory Commission (NERC), the independent regulatory body with authority for regulating the electric power industry (see Figure 27).

Figure 27. Structure of power sector post-privatization



Source: Ley, Gaines, and Ghatikar 2015

However, the privatization process was poorly executed and most GENCOs and DISCOs were purchased with minimal due diligence, limited warranty protections, and no government support (Papaefstratiou, 2019). Lack of auditing reports and accounts data meant that buyers were unaware of the running costs of DISCOs and limited revenues until after purchase. The operational capabilities of some of the privatized assets deteriorated throughout the privatization process. As a result, the system is running on heavy losses with both GENCOs and DISCOs unable to fulfill their financial obligations to one another (Papaefstratiou, 2019). This has resulted in a high level of debt which threatens to engulf the power system.

A major reason for low revenues is that more than 50 percent of distributed power is consumed free of charge. In other words, less than half of customers pay for electricity usage (PwC, 2016). Nigeria's privatized power sector typically does not use meters to provide invoices, bill collections are low, and energy tariffs have remained fixed for three years, meaning customers receive unsustainably cheap electricity (Akwagiyam & Carsten, 2018). Furthermore, theft of electricity is commonplace, and corruption is rife in revenue collection, most of which is carried out manually (PwC, 2016).

Debts across the sector are also the result of a currency crisis that took hold in 2016. The bulk of power company costs are in US dollars, but customers pay for power in naira. The naira lost about 30 percent of its value against the US dollar in June 2016, but the devaluation was not factored into the tariff structure, which has remained unchanged (Akwagiyam & Carsten, 2018).

There is an urgent need to enforce a cost-reflective tariff and improve recovery of dues by the DISCOs. Currently, electricity distribution companies recover so little revenue from customers that they pay less than a third of what they owe to generating companies—a major reason why debt has ballooned (Akwagiyam & Carsten, 2018). Power plants do not operate on full capacity as it is prohibitively expensive; this leads to most of Nigeria's established capacity not being utilized. Realistic pricing will not only allow the cost of generation to be recovered, but also fund investments in new large-scale generation and transmission projects.

Vandalism of electricity facilities and gas pipelines is also commonplace, and the power infrastructure is routinely targeted by militant groups. Vandals break into pipelines and sell the oil (Mmeje, Ayuba, & Mohammed, 2017). Vandalism of gas pipelines and transmission infrastructure may be prevented by building proposed power plants close to gas infrastructure or by investments in disruptive logistical solutions for the transportation of gas from source to where it is required. In the long term, it is also beneficial to invest in communities in oil producing regions to improve their livelihoods. There is also a need to crack down on electricity theft and reduce losses due to corruption. An electricity theft bill was introduced in the Senate in 2018 but has yet to be passed into law (Uzoho, 2018).

Currently, natural gas accounts for more than 80 percent of Nigeria's generating fuel needs. About a 30-percent increase in available generation is possible if the gas constraints are resolved (PwC, 2016). However, distribution and transmission capacities must significantly increase to warrant further gas supplies. The DISCOs particularly need to improve their own networks to take up all the increased power generation.

Energy efficiency should also be embraced by stakeholders and the population at large as a cost-effective tool to save electricity and to improve the reliability of the power system. Awareness-creation measures are as important as mandatory standards and voluntary pilot projects in order to demonstrate the viability of this approach (Ley, Gaines, & Ghatikar, 2015).

Finance

As with most small and medium enterprises (SMEs) in Nigeria, access to finance is a challenge. Tech firms require more than incubation hubs and acceleration programs; they need greater access to financial institutions and venture capital in order to expand their operations. They also need domestic investors to step up.

Grants are an important source of funds for tech start-ups, particularly in the initial stage when the business is being set up. According to a European Commission review, there is strong evidence to support early-stage public investment in innovative firms. The review found that high-growth-potential firms, which receive public funding in the form of equity, experience stronger increases in employment and turnover compared to the control groups (Szkuta, Stamenov, & Ianshyna, 2017). This investment must be complemented by incentives for private sector financing as well, in order to minimize crowding-out and to ensure diversification.

India, which has a burgeoning tech industry, has various grants and financing options for ICT business start-ups (Inc 42, 2018). These are sponsored by both the federal and state governments, and some have been around for almost two decades. The Nigerian government should learn from this successful example and look into public financing schemes for tech businesses. For example, it can provide incentives for the underwriting of grants for qualified tech businesses by the Bank of Industry. It is important to ensure these financing options are accessible to locally trained Nigerian entrepreneurs who are less likely to get funding from VCs and international donors.

Tax holidays are often used to reduce sales taxes by local governments, and to stimulate foreign investment. In Nigeria, the pioneer status regulations entitle qualifying entities and companies to an income tax “holiday” for up to five years (three years initially and renewable for an additional two years). Although a commendable initiative, the requirements for obtaining pioneer status are still too cumbersome for most tech start-ups. In order to qualify, a firm must show capital expenditures in excess of 10 million naira, which is beyond the capacity of most tech start-ups (Perchstone & Graeys, 2018). If tech start-ups are to enjoy the reliefs and incentives offered by pioneer status, a review of this threshold is recommended.

The Nigerian government is eager to improve access to finance for SMEs and has taken a number of initiatives in this regard. Earlier this year the Nigeria Central Bank issued a directive aimed at increasing financing to SMEs. According to the new policy, banks are obliged to have a minimum loan-to-deposit ratio of 60 percent, a move intended to force banks to lend more to the real economy and buy fewer government securities (Whitehouse, 2019).

However, as one analyst notes, several interventionist initiatives to create SME lending programs by the Central Bank have generally been short lived, proving unprofitable for the banks. Instead of looking to dictate policies to banks, Anino Emuwa argues it is preferable to encourage the banks’ investment in innovative SME credit models. Such incentives could be tax breaks on profits to lending to SME, or on R&D investment into SME lending models (Emuwa, 2015). Moreover, with new and growing businesses in the SME sector, banks will likely need to take an active role in helping owner-managers improve their business management skills.

The Nigerian government has also taken steps to set up institutions that will improve the lending regime throughout the country. This includes establishing a national collateral registry and a credit reporting system, with assistance from the World Bank. Collateral registries are publicly available databases of interests in or ownership of assets. The registry will allow low-income people and small-

scale entrepreneurs to secure loans against movable assets such as machinery, livestock, and inventory. A credit reporting system helps to bridge the information gap between borrowers and lenders. Credit reporting allows lenders to learn more about borrowers' characteristics, past behavior, repayment history, and current debt exposure.

In May 2018, the government also reformed the Insolvency Law in accordance with international best practices. Insolvency laws regulate the exit of firms from the market and make resolution of multiple creditors' conflicting claims more orderly. The updated insolvency regime shifts the focus of insolvency in Nigeria from business liquidation to business rescue (Olanipekun, Perenami, Oluwasemilore, & Odinaka, 2018), thereby making investments safer. These are all positive steps, but the real challenge is in effectively implementing and sustaining these policies for the long-term. There are various examples in recent years of government policies being enacted with much fanfare but ultimately leading to little change on the ground.

The Nigerian government should also look into improving incentives for investors. There are currently no policies to incentivize angel investors to support tech entrepreneurship or capital gain tax exemptions for early-stage investments in start-ups, which are seen as good investor incentives. The government can also assist start-ups by making public procurement more accessible. Public spending is a large share of the GDP in developing countries and Nigeria is no different. In India, start-ups are exempted from the "prior experience/turnover" criteria applicable for normal companies when answering to government tenders (Cleartax, 2019).

Finally, there is a need for greater investment in R&D to help boost the tech industry. India spends about 0.7 percent of its GDP on R&D as compared to 0.2 percent by Nigeria (UNESCO, 2019). By prioritizing the tech sector and allocating resources to it, the Indian government has helped the tech industry grow to over \$14 billion (The Economic Times, 2019). If Nigeria is to follow suit, more public spending on research will be needed.

Gender

A new report from the Federal Ministry of Women Affairs prepared for Beijing+25 (the 25th anniversary of the Beijing Declaration and Platform for Action aimed at advancing women's rights) highlights the gender disparities in science education and computer literacy that need to be addressed (Federal Ministry of Women Affairs and Social Development, 2019). Among other things, it highlights the African Development Bank (ADB) Assisted Skills Training and Vocational Education Project. The project helps the government to restructure vocational and technical education so that it meets the demand for skills in the private sector. The project is focused on selected science and technology colleges, teacher training institutes, nomadic nonformal vocational training centers, and women's vocational training centers to improve their effectiveness. These institutions will serve as demonstration centers to promote nationwide reforms.

Other programs might help as well. The "1000 Girls in Training" program seeks to create an ICT talent pool, with a commitment from Huawei to recruit some of the trainees as employees. ICT Girls functions in partnership with two NGOs—Women in Technology in Nigeria and the Women's Technology Empowerment Centre—to ensure that more girls choose careers in ICT. The focus is on providing training in the areas of animation, website development, blogging, software development, graphics design, games, and computer programming.

A draft bill pending in the National Assembly calls for the elimination of all forms of gender discrimination. It calls for the prohibition of discrimination "either through words spoken, acts,

inactions, omissions, laws, regulations, administrative procedures, policies, guidelines, rules, customs or practices discriminate against any person on the ground of gender, age or disability” and asks all actors—both public and private—to “take all appropriate measures, including regulatory policy, fiscal and administrative measures, to ensure the full development and advancement of all persons, especially young women and girl children, for the purpose of guaranteeing to them the exercise and enjoyment of human rights and fundamental freedoms on a basis of non-discrimination and equality of all persons.” It recommends temporary special measures “aimed at accelerating de facto equality of opportunity and treatment between men and women” and states that in the political and public sphere, “a minimum of 35 per cent of all offices, positions, or appointments is reserved for women.” Both public and private actors would bear responsibility for initiating change, especially in social and cultural norms. The bill calls for families to treat all members equally and for widows to be treated fairly.

The bill contains powerful language for the elimination of discrimination in education and employment and for the elimination of discrimination on the grounds of marital status. The bill calls for the “same conditions for career and vocational guidance, for access to studies and for the achievement of certification in educational establishments of all categories in rural as well as in urban areas; this equality shall be ensured in pre-school, general technical, professional and higher technical education, as well as in all types of vocational training” and “same and equal opportunities to benefit from scholarships, bursaries, and other study grants.” With regard to employment, the bill calls for the implementation of seven sets of rights for women—the right to work, the right to equal employment opportunities, the right to free choice of profession, the right to equal remuneration, the right to social security, the right to maternity leave, and the right to protection of health. If enacted, this bill could open up opportunities for women in the tech sector and many other sectors, while also putting Nigeria at the forefront of women’s rights.

6. Conclusion

It is likely that the tech sector will be a fairly niche industry and not a mass employer. But there are linkages to the rest of the economy that are very important—without a sector like this, Nigeria and other African economies will find it much harder to climb on to the digital economy bandwagon. The tech sector provides a vital local source of expertise, not just for the introduction of e-government or digital identification but also for strengthening the value chains of other sectors (and perhaps driving up employment in those sectors). The downside of a possible brain drain from Nigeria to the United States is likely to be outweighed by the prospect of getting a US visa—this is a big incentive to being trained in IT, which, in turn, increases the supply of tech workers to local firms. There is also an international market in programming services that does not require people to migrate—they can be hired from anywhere in the world. Investments in the tech sector are therefore likely to pay off in a variety of ways.

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