



*Source: Co-Creation Hub Lagos*

# **Microeconomics of Competitiveness Final Paper**

## **Lagos ICT Services Cluster**

**Bola Adetunji, Bookang Seol, Johannes Lohmann,  
Jovana Sljivancanin, Petter Bryman**

**Note:** Bola Adetunji is a Nigerian citizen

## Contents

Executive Summary .....	1
Nigeria and Lagos .....	2
Nigeria - Economy .....	3
Lagos - Context .....	4
Lagos - Economy and Endowments .....	4
ICT strategy for Nigeria and Lagos .....	5
The Lagos ICT Services Cluster .....	6
Entrepreneurial momentum .....	6
Comparing Lagos to Johannesburg and Cape Town .....	8
Cluster Map .....	9
Main Players of the ICT Services Cluster .....	10
Determinants of Competitiveness for the ICT Services Cluster .....	12
Macroeconomic Environment .....	12
Endowments for ICT .....	16
Human Capital: Nigeria .....	16
Human Capital: Lagos .....	16
Human Development and Effective Public Institutions .....	17
ICT Infrastructure .....	21
Microeconomic Competitiveness .....	23
Quality of the Business Environment .....	23
Recommendations .....	26
Bibliography .....	29

## Executive Summary

Lagos, Nigeria's own megacity, has recently gained a reputation as a regional ICT services hub. For Nigeria, the promise of a globally competitive ICT industry is particularly important given the country's long dependence on oil, which has had a deleterious effect on the economy.

The Lagos ICT services cluster remains in its infancy, but early success stories like ICT Incubator CcHub and the pan-African ICT consulting network Andela, along with the attractiveness of Nigeria as the single biggest market on the African continent seem evidence of its growth potential. The key challenge is thus to ensure that this potential is realized, and that existing ICT companies can scale up and new ones be successfully created.

In growing its ICT services cluster, Lagos struggles with a number of macroeconomic and microeconomic issues. On the macroeconomic front, plummeting commodities prices have inflated Nigeria's deficit, increased inflation and rapidly depleted foreign reserves. This in turn has limited the competitiveness of import-dependent domestic players. Given the poor macroeconomic and governance context, the success so far of the ICT services cluster in Lagos has been achieved in spite of, not due to, the efforts of the public sector.

In terms of microeconomic constraints, the sector has long struggled with low human capacity, weak public institutions, and a less-than-ideal business environment. Nonetheless, Lagos has seen its local ICT services cluster gain some momentum in recent years, partially thanks to the city's prominence as a start-up hub that rivals the best in its class in Africa. In this paper, we will discuss a number of ways in which Lagos could make the cluster more competitive, including increasing access to ICT-relevant education, liberalizing the foreign exchange market, improving ICT infrastructure, increasing cluster cooperation, and improving the regulatory framework.

## Nigeria and Lagos

The Federal Republic of Nigeria is located on the Gulf of Guinea in Western Africa, close to the equator. Nigeria contains 32 states of various economic, ethnic, and demographic profiles.

Figure 1: Nigeria (CIA, 2017)



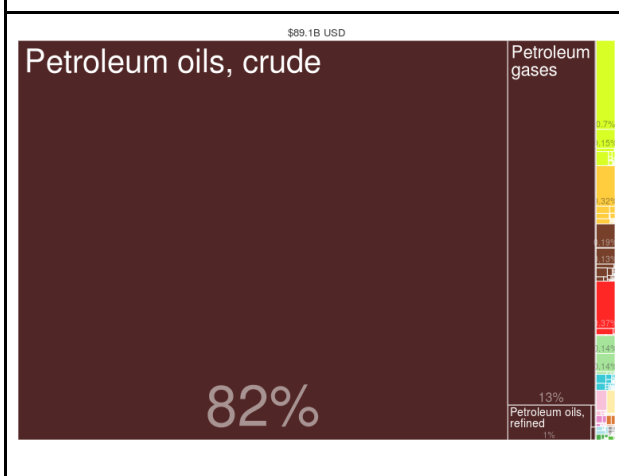
Nigeria's modern history was largely dominated by European colonial rule and ethnic discord, the consequences of which continue to affect national governance and stability today. The arrival of the Portuguese and the commencement of the slave trade in the 15th century brought Western influences to the coastal areas (Library of Congress, 2008). Western dominance along the Gulf's coast continued through the British fights against transatlantic slave trade in the early 19<sup>th</sup> century, and their subsequent colonization of much of West Africa. British institutions and rule of law were immediately imposed and maintained in the South. Nigeria was unified and gained independence from the British on October 1, 1960. However, the ethnic, religious, and cultural differences between the regions continue to cause political tensions and violent conflicts.

Nigeria's turbulent history and volatile governance have affected its economic development. Over 62% of Nigerians were estimated to live in extreme poverty in 2014, and the country ranks as 163<sup>rd</sup> of 230 countries in terms of GDP per capita, at US \$5,900 (CIA, 2017).

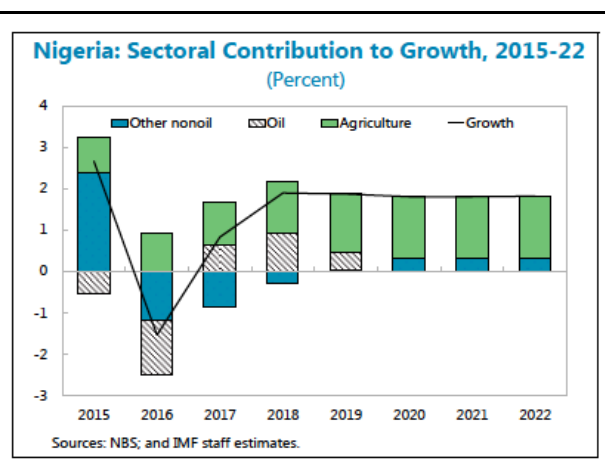
## Nigeria - Economy

Since the discovery of crude oil in the late 1950s, the Nigerian economy has been highly dependent on oil production and exports, and consequently also on world market prices for oil. The oil and gas sector is estimated to account for some 6% of Nigerian GDP and crucially also about 40% of total government revenue (IMF, 2017). Furthermore, oil revenue constitutes a very substantial share of Nigerian foreign exchange earnings needed to fund the very significant trade deficit in non-oil products as well as imports of refined oil, which Nigeria does not itself produce. In 2014, about 96% of the national exports were petroleum-based, while agriculture accounted for less than 1% of national exports (CID, 2017). Yet despite its low productivity and low value added compared to oil, many Nigerians still work in agriculture - about 30% in 2010 (World Bank, 2017).

**Figure 2: Nigerian exports by sector, 2014**  
(Center for International Development, 2017)



**Figure 3: Sectoral contribution to growth**  
(IMF, 2017)



## Lagos - Context

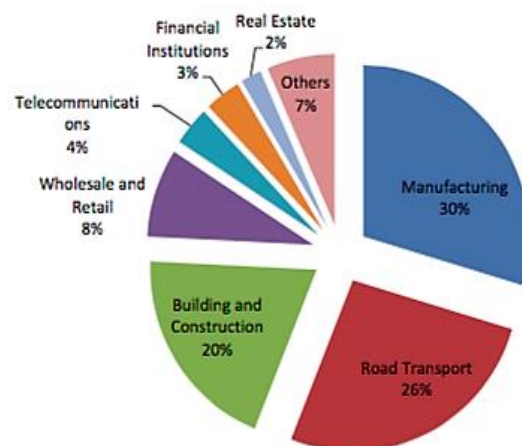
Lagos State is physically the smallest among Nigeria's states, yet economically arguably the most significant. If it were a country, it would be Africa's seventh largest economy in 2014 (Kazeem, 2017). Lagos is a massive city of 21 million people and the commercial and financial capital of Nigeria. According to the World Economic Forum, population growth rate in Lagos is 77 people a day (Myers, 2016).

Because of its accessible location and port, Lagos has historically enjoyed more autonomy compared to the rest of Nigeria (Filani, 2012, p. 10). Its early integration into the British trade routes and subsequent adoption of British style institutions allowed Lagos to become integrated into the global economy sooner than other parts of Nigeria after independence.

## Lagos - Economy and Endowments

As the country's financial capital, Lagos hosts the headquarters of most of the major companies that operate in Nigeria. As of August 2015, the GDP of Lagos state was estimated at around US \$137 billion - about 25% of Nigeria's economy (PwC, 2015, p. 7). In contrast to most Nigerian States, the economy of Lagos State is quite diversified, as shown below.

**Figure 4: Economy of Lagos (World Bank, 2014)**



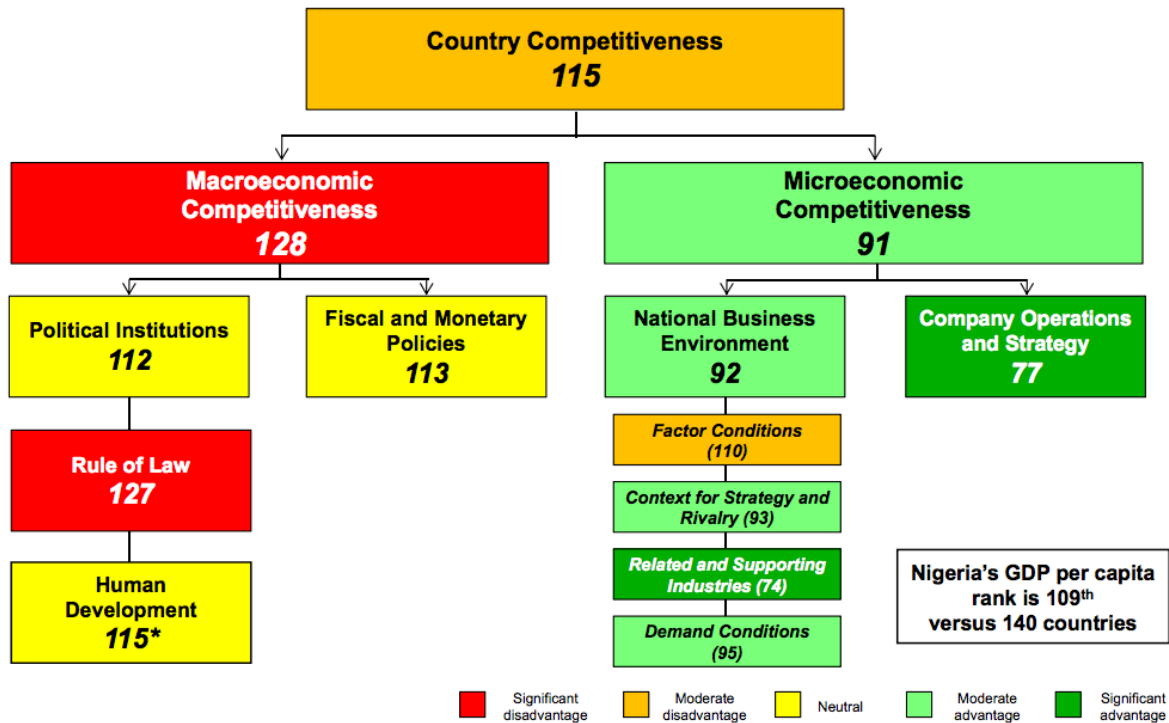
A major push to reconstruct local infrastructure to meet the local demand has been undertaken in recent years. This included revamping the Lagos Murtala Muhammed airport and upgrading the Lagos mass transit system to enhance easy movement of commuters across the city (Filani, 2012). Efforts to improve the Lagos power supply generation are also ongoing: two major power plants are currently being built (PwC, 2015, p. 21).

## ICT strategy for Nigeria and Lagos

Nigeria's focus on developing its ICT industry is central to its plans to diversify its economy away from its reliance on oil. Michael Porter's 2013 assessment of Nigeria's ICT competitiveness highlighted the macroeconomic environment to be a particular constraint, while the microeconomic environment showed promising potential (Figure 5). While Lagos may fare somewhat better than Nigeria with respect to microeconomic competitiveness of its ICT services, it is still subject to the national context and policies with regards to its macroeconomic competitiveness – where significant challenges remain. Specifically, compared to 2013 we argue that: (i) National fiscal and monetary policies have worsened; (ii) Lagos factor conditions / microeconomic competitiveness overall are better than the national ones, but still represent a challenge.

The rest of the paper is structured as follows: we first describe the ICT cluster in Lagos, then examine national macroeconomic trends and challenges that Lagos is subject to; analyze the factors impacting microeconomic competitiveness, and lastly make recommendations for policy makers on how to strengthen the local ICT services cluster.

Figure 5: Nigeria's ICT Competitiveness (Porter, 2013)



Note: Rank versus 140 countries; Color coding based on comparison relative to income; \*U.N. Gender Inequality Index data is unavailable for Nigeria. Nigeria's Basic Health and Education rank is reported as an average of ranks in reported data.  
 Source: Institute for Strategy and Competitiveness, Harvard University (2012), based in part on survey data from the World Economic Forum; analysis prepared based on research findings by Scott Stern, Mercedes Delgado, and Christian Ketels.  
 20130321—National Competitiveness Council of Nigeria Presentation—FINAL 54 Copyright 2013 © Professor Michael E. Porter

## The Lagos ICT Services Cluster

### Entrepreneurial momentum

Lagos has become one of the leading entrepreneurial ecosystems in Africa. Fittingly, Lagos' Yaba neighborhood has earned the nickname "Yabacon Valley", naturally with reference to California's Silicon Valley, given the high number of ICT startup companies located in the area. Worth over \$2 billion, the scene is second to none in Africa in terms of value, and second only to Cape Town in terms of number of entrepreneurs, with between 400 and 700 active start-ups compared to Cape Town's 700 to 1,200 (Jackson, 2017). Nigerian entrepreneurs tend to stay domestically focused, with only 11% of start-ups looking to expand internationally (ibid.).



Local success stories are building Lagos' reputation as a tech hub. Andela, a global technology start-up based in Lagos, has attracted \$24 million in funding from the Chan Zuckerberg Initiative, Mark Zuckerberg's philanthropic project, among others, and is building a pan-African talent base that offers outsourced development solutions (Soobadoo, 2017). While there are relatively few big success stories so far, new start-ups like Lidya, which just raised \$1.25 million for its fintech solutions, provide momentum for the future of the ecosystem.

The ecosystem has benefitted from the strong support of local financiers. Lagos' start-ups enjoy much higher funding levels in their seed phase than Cape Town start-ups, at \$77,800 in Lagos compared to Cape Town's \$20,200 (Kazeem, 2017). Earlier this year, the Lagos Angel Network opened its first round of funding with between \$79,500 and \$159,000 awarded per start-up (Mulligan, 2017).

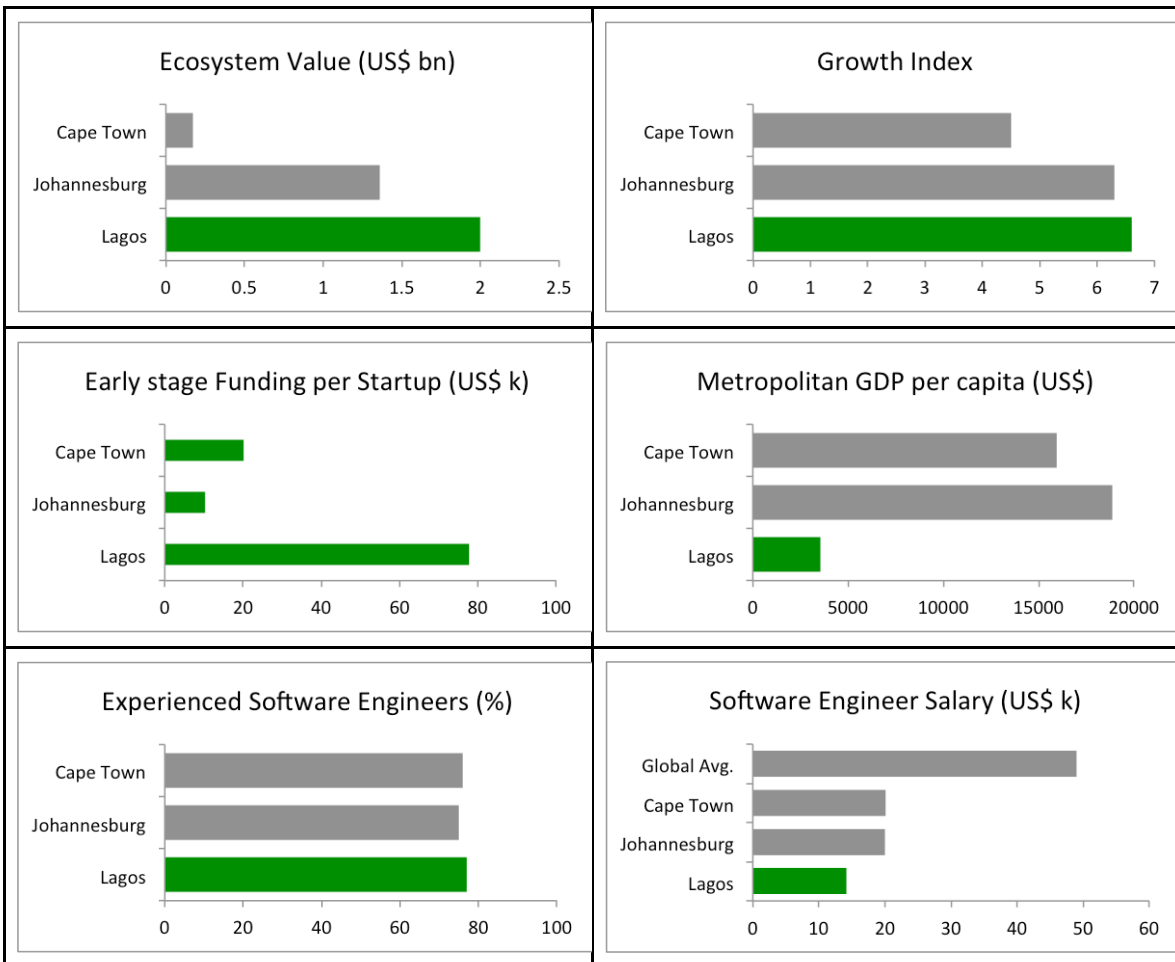
Lagos has developed into the major commercial and financial hub of Nigeria. A substantial share (approximately 60%) of industrial investment in Nigeria is directed to Lagos, and about 90% of companies that operate across industries in Nigeria have chosen to locate their headquarters in Lagos, thereby benefitting from the environment already created by existing investors. All commercial banks except one are headquartered in Lagos, providing a further major attraction for locating investments to Lagos (PwC, 2015, p. 21).

Another important supporting factor for the ecosystem is the presence of intermediary organizations supporting the ICT sector. Lagos' Co-Creation Hub (or CcHUB), for instance, brings together entrepreneurs, investors, academics, public agencies, employers, and others in a bid to foster collaboration. CcHUB also stages public forums that feature speakers and bring investors from Silicon Valley and elsewhere (Eleso, 2017).

## Comparing Lagos to Johannesburg and Cape Town

The 2017 Global Startup Ecosystem Report identifies Cape Town, Johannesburg, and Lagos as the three key hubs and drivers of technology-driven entrepreneurship in Africa. Lagos is the youngest among the three and deemed to still be in its infancy stage. However, Lagos outperforms Cape Town and Johannesburg in terms of ecosystem value, growth, and the percentage of experienced software engineers. In contrast, metropolitan GDP per capita and software engineer salaries are much lower.

While early stage funding per startup in Lagos dwarfs those of Cape Town and Johannesburg, this is indicative of a steep growth curve in a young ecosystem that is starting from a low base. The startup output of Lagos is estimated to be less than half of that of Cape Town. As the number of Lagos-based ICT startups increases, the funding per startup is likely to decrease while the need for experienced software engineers will increase. Resolving these two potential bottlenecks is crucial for the Lagos ICT startups to be able to reach their potential and productively tap into the large and growing local market.



Source: (Startup Genome, 2017)

## Cluster Map

Lagos' ICT services cluster is still in its infancy. This entails that Lagos entrepreneurs are still almost entirely dependent on local resources and skills, while their global connectedness is still limited. In fact, the Global Startup Ecosystem Report estimates that in 2016 only 15 people have moved from abroad to Lagos to start own businesses - compared to 83 on average, globally, and 2,049 in Silicon Valley (Startup Genome, 2017).

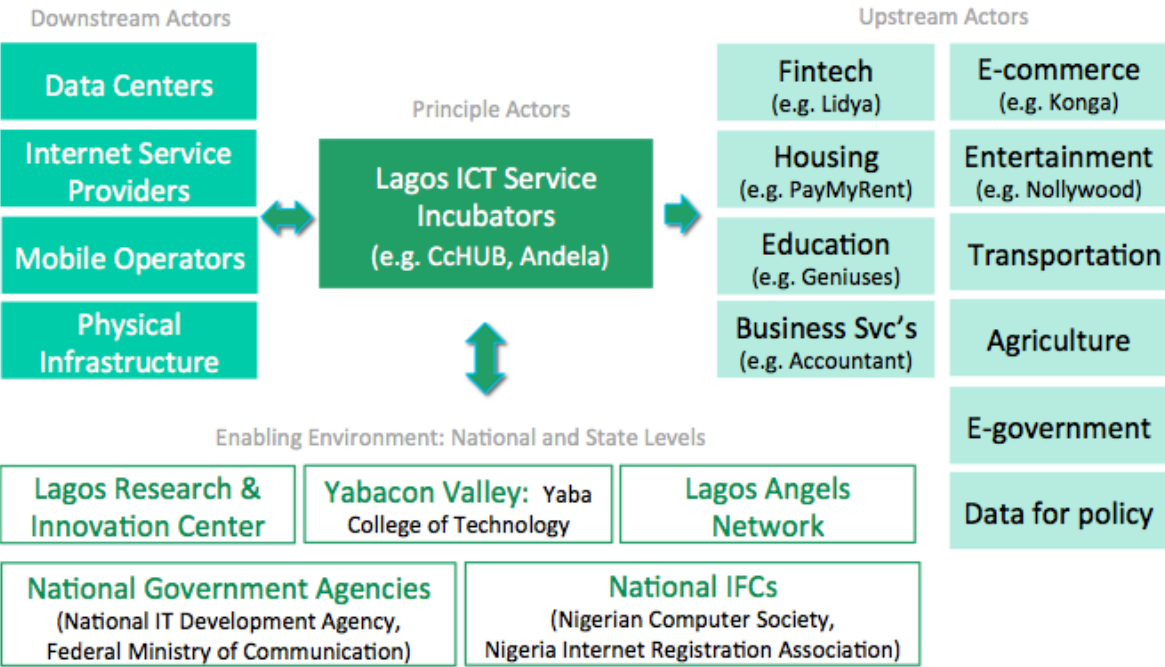
The Lagos ICT cluster only truly gained international attention and momentum in the last five years, with the rise of Lagos ICT Service Incubators Co-Creation Hub (CcHUB) and Andela. Located in Yabacon Valley, these two firms have been able to benefit from and create conglomeration effects in the region. The brand of the Yabacon Valley has transcended the borders and attracted significant domestic and foreign capital into the region. The visit of Facebook's Mark Zuckerberg to Andela (as well as his investment in the company) last year has further increased the international interest in Nigeria. In early 2017, a charter flight of technology investors from Silicon Valley, known as Geeks on a Plane, has paid Yabacon Valley a visit while scouting for investment opportunities in Africa.

Interestingly, the story of the Lagos' ICT service cluster is that of dual objectives. On the one hand, a range of upstream actors/companies focus on exploring business opportunities and the scale of serving the large populations of Lagos and Nigeria. Some focus on traditional business services (e.g. digitizing accounting), while others are more innovative in unlocking existing market failures (e.g. through finding digital marketplace solutions for the Lagos housing market - both in terms of apartment search and designing financial instruments to make rent more affordable).

On the other hand, developments in the ICT sector are spurring efforts to improve education and skill development that could make the ICT sector a viable source of employment for generations of Nigerians to come. In fact, the efforts to improve STEM - and particularly IT -

education in Lagos are mostly driven by the private sector (the cluster), as Lagos does not yet have a sufficiently strong STEM-focused university. Yaba College of Technology and Lagos State University are close, but the curriculum at these universities is not relevant enough for the talent needs of the cluster, nor does it educate a sufficient number of people. Therefore, Lagos is currently partnering with Andela and CcHUB to reshape the State’s education system and make it more relevant for the ICT industry’s needs. In this sense, collaboration between government agencies and the ICT cluster’s principal actors is regarded as relatively strong at the State level.

**Figure 5: Lagos ICT Cluster Map**



**Main Players of the ICT Services Cluster**

Lagos boasts a relatively small but quickly growing field of ICT players that includes both foreign and home-grown ventures. In this young ecosystem, local software companies like Chesca Technologies & Systems and Labyet Polaris Nigeria coexist next to international giants like

Microsoft (IDAL, 2015, p. 9). Computer assembly companies such as Zinox Technologies and Omatek were some of the early entrants into the ICT Services space (Government of Nigeria, 2009, p. 40). Since then, the cluster has evolved substantially.

In the field of e-commerce, Jumia, an online retailer founded in Lagos in 2012 with backing from Rocket Internet now has over 3,000 employees. Other e-commerce success story include Konga, Hotels.ng, Hellofood and Gloo.ng where consumer online shopping is expected to increase from 15% to 63%, and online expenditure by \$297 million by 2018 (PwC, 2015, pp. 51-52).

E-commerce solutions for agriculture have built a particular niche in Lagos. E-wallet, an electronic wallet system provided by Cellulant Nigeria, a mobile banking provider with a broadening regional presence, is now being used by the Nigerian Ministry of Agriculture and Rural Development to support local farmers with vouchers that they access through their cell phones (Dalberg, 2014, p. 9). MoBiashara is a mobile banking solution developed by the US-based company Slimtrade that serves agricultural agents in the buying and selling of inputs and produce (ibid.).

Mobile money is making an increasingly serious impact, although it remains comparatively small. As early as 2012, a handful of banks (Stanbic IBTC, GTBank, PocketMoni, United Bank of Africa, EcoBank, FirstBank and Pagatech) had started marketing mobile banking solutions after receiving a license from the central bank (Odufuwa, 2012, p. 12).

In the field of e-learning, Bridge International Academies is a prominent example. A foreign company with a rapidly growing international footprint, Bridge is now active in a number of Sub-Saharan African countries. Bridge, a relative newcomer in Nigeria, operates low-cost primary schools and uses technology-enabled teaching methods (Dalberg, 2014, p. 6). The educational sector has also seen a lot of movement of entrepreneur as young innovators are coming into the e-education sector of ICT. Companies like Wizeitup, who are using digital tools for self-

learning to power basic primary education. Other players are Kotivu.ng, Tutors.ng, Prepclass.com.ng and Dexlearn. These companies are all based in Lagos and are helping reshape the ICT industry.

Even in agriculture, ICT has the potential to lead to large improvements and efficiency gains. A number of new arrivals focus on providing farmers with better information on products, pricing, and locations - with the objective of helping users make better business decisions. Examples of such organizations include MoBiashara and iCow. The company IYA ICT, located on the border town of Lagos State and Ogun State (Joga Orile) has adopted drone technology to capture and monitor the performance of crop farms and do better analysis of research finding in conjunction with International Institute of Tropical Agriculture (CTA, 2016, p. 12).

Lacking continuity in terms of government support has been highlighted by Nigerian entrepreneurs as an issue that is holding back the growth of the ecosystem (Eleso, 2017). Nonetheless, the use of e-Government services is currently on the rise - not only in Lagos, but across the nation. Technology innovations include electronic payments for all civil service transactions, electronic publication of annual matriculation examination results and National Youth Service Corp postings, and GIS mapping of land allocations (Odufuwa, 2012).

## Determinants of Competitiveness for the ICT Services Cluster

### Macroeconomic Environment

Given Nigeria's dependence on oil, the precipitous drop in world market prices for oil from levels above \$100 per barrel prior to 2014 to lows of around \$30 per barrel in 2016 has severely tested government finances as well as the overall macroeconomic stability of Nigeria. The current account swung sharply into deficit in 2015 before recovering on the back of reduced imports. The

Nigerian economy contracted by 1.5% in 2016 and the consolidated government deficit reached 5% of GDP with total nominal expenditures of more than double government revenue (IMF, 2017, pp. 2, 33).

With regard to the private sector and the overall competitiveness of the Nigerian economy, the primary impact of the drop in oil prices has been a sharp increase in the rate of inflation, reduced access to foreign exchange for firms due to the deterioration of the external balance, and uncertainty surrounding the government's current and future ability to sustainably fund public services, including education and infrastructure (EIU, 2017a, pp. 6-8).

### **Rationing of Foreign Exchange**

Like many other major oil exporters, Nigeria has long maintained a pegged exchange rate between its local currency, the Naira, and the US dollar. However, the rapid decline in world oil prices with its concomitant negative effect on Nigeria's external balance put the peg under severe strain. Having been forced to devalue the Naira in July 2016, the Nigerian authorities currently maintain a form of managed float. Both in order to control the exchange rate and more fundamentally because of the dearth of foreign exchange earnings, Nigeria has been forced to resort to a series of restrictions on its external accounts and domestic rationing of foreign currency (IMF, 2017, pp. 15-16).

The central bank has instituted restrictions on access to foreign exchange for specific categories of goods - in effect imposing import restrictions. The Central Bank of Nigeria up until 2016 maintained tight restrictions on the inter-bank market for foreign exchange, and while these have formally been eased, the foreign exchange market continues to function poorly with low transactions and a wide spread against the parallel black market rate. Overall, the foreign exchange market remains segmented and access to foreign currency is still subject to government

intervention and approval. Consequently, there is also a rampant black market for foreign currency, operating at significant spreads over the official rate (IMF, 2017, pp. 15-16).

The distortions in the foreign exchange market have had a very concrete negative impact on two of Nigeria's four major mobile network operators: Etisalat Nigeria, which is 45% owned by its Abu Dhabi parent company, defaulted on a \$1.2 billion bond issue in February after the company had not been able to access the foreign currency to service its dollar-denominated liabilities. As a consequence, Etisalat Nigeria now risks being taken over by its creditors, mainly Nigerian commercial banks, while the parent company is apparently considering exiting the Nigerian market (Carvalho and Oluocha, 2017).

Meanwhile, South African operator the MTN Group - the largest network operator in Nigeria and the African continent, has recently become the subject of an investigation by Nigerian lawmakers on accusations of repatriating up to \$14 billion in profits out of the country in violation of foreign exchange restrictions over the past decade (Cotterill and Fick, 2016).

Foreign exchange restrictions thus have had a substantial and negative impact on the ICT sector in Nigeria, particularly for the major operators in the country, which are largely foreign-owned and operate in a capital-intensive industry that requires substantial imports of high-tech goods.

### **Fiscal Constraints Limiting Government Investment**

The falling oil price and the associated sharp drop in GDP growth in Nigeria has proven disastrous for the government's fiscal position. The oil price drop has most severely affected the federal government's accounts, with total projected expenditures in 2017 almost treble that of projected revenue. According to the IMF, fully two thirds of federal revenue were spent on interest



payments in 2016, with the ratio expected to increase to upwards of 80% according to the IMF's projections (IMF, 2017).

The situation looks somewhat less bleak when focusing on the position of the Lagos state government, as it is less dependent on oil-linked revenues. The official 2017 state budget projects a 170 billion Naira deficit - about a quarter of projected annual revenues. Total debt service costs, including interest, principal and sinking fund provisions, are projected to amount to about 100 billion Naira, or 15% of total revenue in 2017. Meanwhile, federal transfers only make up about a quarter of total revenues (Lagos State Government, 2016, p. 1). Slightly more than half of Lagos state expenditure is devoted to items other than personnel and debt service costs, with about 40% of what the State government terms capital expenditure being spent on infrastructure and transport. Only about 5% of capital expenditure is devoted to education, but this area accounts for more than a third of total personnel costs (Lagos State Government, 2016b).

Barring a pick-up in the oil price or major improvements in government revenue collection it appears quite evident that the fiscal position of the federal government will face major strain over the coming years. The fiscal assessment for Lagos state government, which is less dependent on oil-based revenues and is not overly dependent on federal government transfers, would appear to be somewhat less dire. While the federal government is currently undertaking a fiscal stimulus program to spend its way out of the recession (EIU, 2017, p. 6), it would, based on the underlying dynamics, appear highly doubtful that either the federal or Lagos state government could sustainably undertake major public investment initiatives in for instance education or infrastructure that could support the ICT sector or other growth sectors of the economy over the coming years.

## Endowments for ICT

### **Human Capital: Nigeria**

With a population of about 185 million, Nigeria is Africa's most populous country and the eighth most populous country in the world (CIA, 2017)<sup>1</sup>. With an estimated growth rate of 2.4% and a median age of 18.3 years in 2016, it is considered to be one of the world's youngest countries, ranked 212 out of 229 countries. Only about 7% of the population are age 55 or above, while about 43% are younger than 15. The remaining 50% of the population are age 15 to 54. As such, Nigeria has significant potential to achieve a labor-driven increase in productivity, but it also faces significant challenges in providing its growing population with adequate basic services, including healthcare and education. The infant mortality rate is still strikingly high at 71.2 deaths per 1000 live births (ibid.). It is estimated that only about 60% of the population was literate in 2015 (69% among males and 50% among females).

### **Human Capital: Lagos**

Lagos is home to about 21 million Nigerians (PwC, 2015, p. 10), and the city keeps growing rapidly due to substantial rural to urban migration. This has brought opportunities for companies looking to hire skilled workers, while also creating challenges for the local administration to provide the much-needed infrastructure to accommodate the growing population.

Yet, the annual statewide survey for FY 2014 revealed that 69% of households members, on average, can read and write in English language, and 63% can read and write in other language apart from English. In total, 86% of household members reported being able to read and write in any language, while 10% could neither read nor write in any language.

---

<sup>1</sup> All figures in this paragraph are taken from the same source

Lagos has several natural endowments such as a strategic location in West Africa, a vast population, natural conditions to host world class ports and its pre-existing status as the commerce hub of Nigeria. However, despite these natural endowments, Lagos falls short on ICT-related human and physical capital developments. First, Nigeria and Lagos suffer from a lack of labor that specializes in ICT. This shortage has become one of the main barriers to growth for the Lagos ICT Service cluster. In recent interviews with local tech entrepreneurs and representatives from Silicon Valley, the scarcity of developer talent was often highlighted as a significant issue (Eleso, 2017). They added that, although more and more Nigerians that are trained in developed countries return back to Lagos, the numbers are not high enough to meet the local demands.

In addition to the issue of human capital, Nigeria's public institutions are also deficient in for instance intellectual property protection and the high prevalence of corruption, which both act as a constraint on private sector development. In terms of the physical infrastructure needed for developing the ICT sector, Nigeria is relatively well developed in urban areas such as Lagos but coverage across the country is notoriously poor, thus negatively impacting the reach and market size of any ICT services offered.

### **Human Development and Effective Public Institutions**

Nigeria has fallen short on developing human capital and improving the effectiveness of public institutions. Nigeria's recent initiatives to address these issues are good signs of progress, but such efforts have not translated to concrete improvements yet.

## Human Development

There are two aspects to human development: increasing human capital at the individual level through education and improving overall productivity by facilitating research and development (R&D).

First, the nature of ICT-related labor necessarily requires high-level abstract thinking and a new and different skillset. Thus, a concrete education system--from primary to university--is the key to individual-level human capital development. However, Nigeria has a poor education infrastructure and it fails to provide the educational training necessary for the ICT sector. The current education system does not prepare students for the future economy, and primary/secondary education does not translate into higher education (Dalberg, 2014). The Nigerian government is aware of this problem and has identified the following list of problems with the education system (Government of Nigeria, 2009, pp. 53-54).

- **Lack of technically experienced teachers:** There is a need for teachers to be computer literate and educated on how to integrate ICT in their taught subjects
- **Limited ICT facilities:** Most learning institutions do not have dedicated laboratory for ICT training and most teachers and students do not have access to computers or the Internet.
- **Inadequate course content for ICT**
- **Lack of national standards related to ICT**
- **Poor complementary infrastructures in primary and secondary schools:** Poor infrastructure, such as inadequate electrical power supply, makes ICT facilities obsolete.

There have been a number of efforts to address the challenge with the delivery of education services. For example, EduTech Software Solutions Limited (EduTech), a private company based in Dubai, UAE that specializes in providing learning solutions, worked with the Nigerian

University Commission to develop an e-learning system (Dalberg, 2014). This system provides a platform for sharing lectures and other educational materials. Students received customized tablets that had access to an e-learning portal. This program is being piloted at the Center for Distance Learning of the Obafemi Awolowo University in Osun State. However, aforementioned problems with the education system persist. Respondents to a recent survey cite poor internet connection and power supply as barriers to e-learning success (Dalberg, 2014).

Second, Nigeria does not yet have a fully developed strategy to improve the overall productivity of the economy by facilitating and investing in research and development (R&D). Though there are a number of schools that are specifically geared toward ICT, such as Yaba College of Technology and Lagos Polytechnics, these schools do not invest in R&D. Despite the recent hype about the ICT sector, the country is far behind in the training and availability of scientists and engineers. In 2009, the country ranked 123rd out of 137 countries on the availability of scientists and engineers (Government of Nigeria, 2009, p. 27). Similarly, the quality of scientific research institutions is also poor. Nigeria ranked 125th out of 137 countries in quality of universities and 80th on university-industry research collaboration (Government of Nigeria, 2009, p. 28).

In an effort to better facilitate collaborations among research institutions, the National Universities Commission (NUC) has implemented the Nigerian Research and Education Network (NgREN), a platform for communicating and sharing information. In addition to being a tool for connecting research institutions, it also seeks to consolidate digital contents in one place (Government of Nigeria, 2013, p. 103). This system has not been fully implemented and thus it is not clear whether it will translate into improving R&D in Nigeria. Although further investigation is necessary, if the lack of coordination is indeed creating a bottleneck, the government's active

role in facilitating research across institutions is a promising first step towards improving competitiveness of ICT sector in the long run.

### **Public Institutions**

The key public institutional element for fostering ICT growth is reducing corruption and protecting intellectual property rights. Compared to South Africa, a competing country with Cape Town rising as another ICT hub in Southern Africa, Nigeria falls short in providing a legal framework suitable for ICT sector. According to the World Economic Forum's so-called Network Readiness Index, Nigeria is underperforming in intellectual property protection and property rights for the ICT Sector, ranking 96th and 86th respectively out of 137 countries (Government of Nigeria, 2009, p. 27). A key deficiency is that the Nigerian copyright act has not been updated since 1999 and thus does not cover much of the type of digital content that has been developed since (International Trade Administration, 2016). Local entrepreneurs have also noted the weakness of the legal framework and the enforcement regime for protecting intellectual property in the ICT sector (Oxford Business Group, 2016). Furthermore, there is as yet no comprehensive legal framework for the use of personal data in Nigeria, as the Data Protection Bill which was first drafted in 2009 has yet to be turned into law.

Nigeria's public institutions also lack transparency, which tends to exacerbate the problem of corruption. The National Assembly of Nigeria passed the Freedom of Information Bill in 2011 and President Jonathan signed them into law in the same year, which guarantees access to public information. While this is a step in the right direction, The Corruption Perceptions Index, published annually by the Transparency International, ranks Nigeria 136th place out of 176 countries with the score of 26 out of 100 (Transparency International, 2015). Specifically, Transparency International argues that the Freedom of Information Bill has not been properly implemented and

a robust implementation of this bill is the first step in the right direction. Tackling corruption has been the top agenda for President Muhammadu Buhari, who was sworn into office in 2015 (Transparency International, 2015). While this is a laudable goal, the key difficulty is of course making progress on its implementation.

## **ICT Infrastructure**

The existence and continuous development of functioning ICT infrastructure remains a sine qua non for the development of any services using ICT as a platform. Extending fixed telephone or internet connections to a population of close to 200 million people spread out across a sprawling land mass of varied physical terrain in a lower-middle income country where consolidated government revenue is less than 10% of GDP presents obvious challenges. For this reason, and also due to a successful program of liberalization in the telecoms market beginning in the early 2000's, Nigeria presents a case of technological leapfrogging where both service providers and consumers have gone straight to using mobile rather than fixed connections for telephony and internet access. The country thus has one of the highest rates of mobile Internet usage as a share of total Internet users. As of 2016, there were some 90 million GSM internet subscribers in Nigeria, representing close to 60% of all GSM subscriptions (EIU, 2017b).

As such, development of key ICT infrastructure has mainly been driven by private sector operators. There are four main mobile services operators in Nigeria, all but one of which are subsidiaries of foreign-owned companies; the South African MTN Group; Nigeria-based Globacom; Indian-owned Airtel and the UAE-backed Etisalat. Several of these companies have been the subject of government scrutiny in recent years. The MTN Group, with a quarter of the group's total customers located in Nigeria, posted its first-ever loss in 2016 and saw its share price fall 40% after it was forced to pay a \$1.7 billion fine to the Nigerian government related to its

failure to comply with regulations on the registration and disconnection of SIM cards (Fick and Cotterill, 2017).

Reception remains notoriously patchy in many parts of Nigeria (40% of rural areas have no coverage), with three of the four operators being fined and barred from selling SIM cards in February 2014 as they could not meet the quality standards set by the National Communications Commission (EIU, 2017b). Even so, the operators are gradually seeking to upgrade their networks to standards that permit higher bandwidth internet access with most companies prioritizing improvements in Lagos and other urban centers. Globacom launched its first 4G/LTE services in select urban locations in Nigeria in October 2016 and has since been followed by both MTN and Etisalat, with Airtel also trialing a 4G network in Lagos (EIU, 2017b).

With a growing focus on providing mobile internet access at ever higher bandwidth the question of availability and allocation of spectrum has grown increasingly important. The Nigerian telecoms regulator in mid-2016, after a two-year delay, began auctioning rights to use the 2.6GHz band, but only received bids from the MTN Group. Its competitors cited a combination of the high minimum cost set at the auction and the difficulty of obtaining funding, either in locally or abroad, due to foreign exchange restrictions and/or the weak Naira (Okonji, 2016).

In addition to mobile connections, broadband access particularly in Lagos has been given a boost in recent years after the Main One underwater fiber optic cable, which connects Africa with Europe, made landfall in Lagos (EIU, 2017a). The development is driven by a privately-owned company funded by a combination of private and public investors, such as the Africa Finance Corporation. The Main One operators have since also been expanding local access to fiber-optic networks particularly in Lagos, ensuring that the city is at the forefront of broadband expansion and development in Nigeria and West Africa (Main One, 2016).

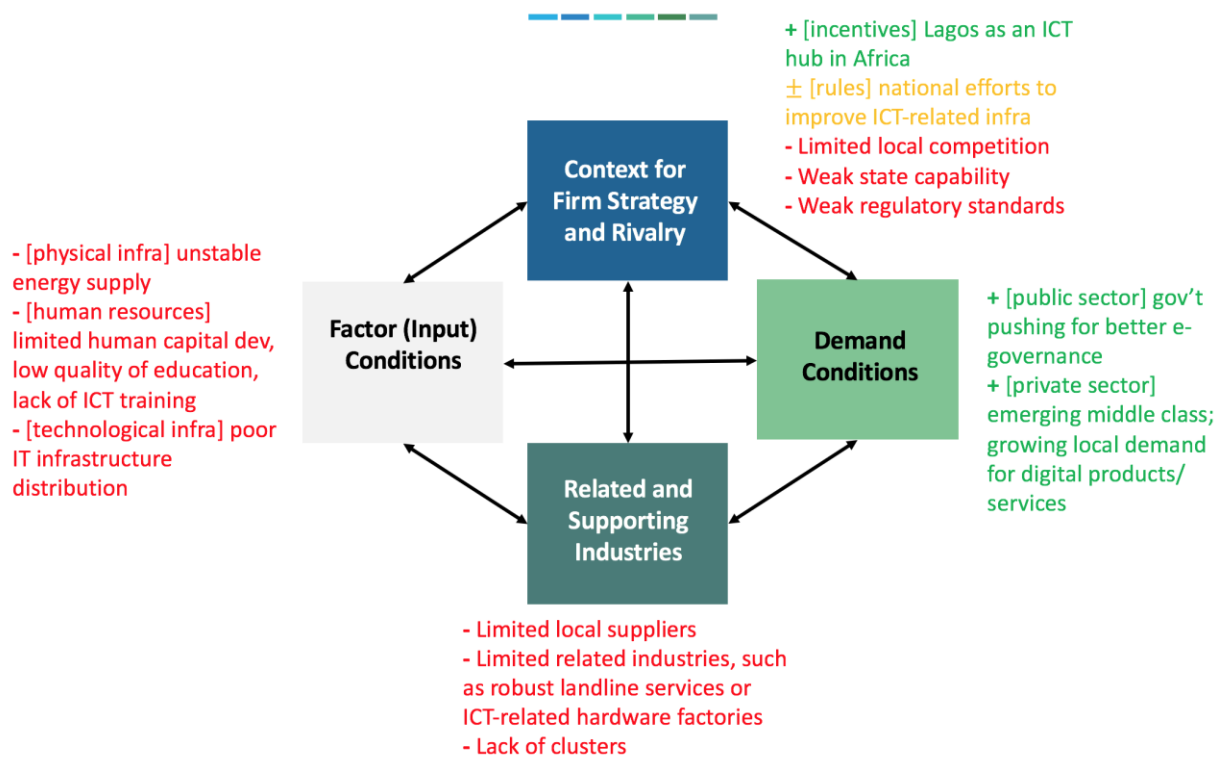


## Microeconomic Competitiveness

### Quality of the Business Environment

The diamond framework is used to analyze the quality of ICT business environment in Lagos. The four determinants of business environments (demand conditions, factor conditions, related industries, and context for firm strategy and rivalry) are discussed in this section. The key findings are summarized in the figure below.

Figure 6: The Quality of Business Environment Diamond



### Demand Conditions

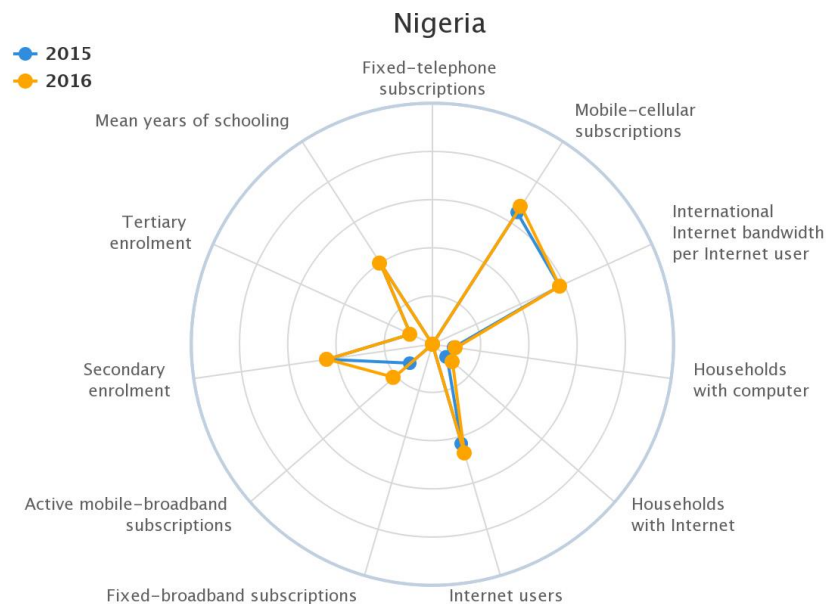
While only 3.4% of households have a fixed internet connection, mobile penetration rate was well over 60% in 2012, which means that there are more than 120 million active mobile subscribers in Nigeria (Odufuwa, 2012). This number is set to rise rapidly; the Internet penetration

is expected to reach around 90% in 2021, according to The Economist Intelligence Unit forecasts. They also predict that mobile subscribers will increase at an average rate of 6.8% per year between 2017 and 2021, reaching approximately 227 million in 2021 (EIU, 2017b). This rapid increase in mobile users translate to increased demand for bandwidth capacity. Since 2010 to 2012, there has been a massive 2,705% increase in wholesale submarine bandwidth capacity, via landings at Lagos (Odufuwa, 2012).

### **Factor (Input) Conditions**

Although Lagos has much more advantageous factor conditions than other cities in Africa, such benefits are often contained within Lagos only. Nigeria, as a whole, has weak factor conditions. This constrains further development of ICT sector. As discussed in the previous sections, Nigeria falls short in physical and human capital, and technological infrastructure.. Similarly, the World Economic Forum's (WEF) Global Information Technology Report 2016 cited Nigeria the 119th in the world in terms of the country's network readiness (World Economic Forum, 2016). This rank has fallen from the 90th in 2009. This trend shows that Nigeria has not been particularly effective in improving factor conditions for ICT competitiveness. The Figure below shows the strengths and weaknesses of factor inputs at the national level in greater detail. While Nigeria is strong in mobile-cellular subscriptions, it is far behind in education, fixed-broadband, and internet/computer use at home.

**Figure 7: Strengths and Weaknesses of Factor Inputs at the National Level (ITU, 2016)**



### Related Industries

ICT can be applied to any industry, including finance, entertainment, agriculture, commerce, and education. Additionally, government can also leverage the ICT sector to improve its service delivery, civic engagement and enabling public safety.

As previously mentioned international ICT giants like Microsoft are also present in Lagos, as well as several large, mostly foreign owned telecoms operators. Nonetheless, Nigeria has been ranked 6th in heavy importation of ICT hardware and software, most of which are low-end ICT products. For high-end ICT products, Nigeria was ranked 115th out of 137 countries. These two pieces of evidence show that while the local demand for ICT is high, Nigeria depends heavily on imports for low-end ICT products, and that Nigeria does not have complementary industries developed enough for other high-end ICT products (World Economic Forum, 2016).

## Context for Firm Strategy and Rivalry

As Lagos receives more attention as the potential ICT hub in West Africa, more and more companies and entrepreneurs will be entering the market. While this enthusiasm increases competitiveness of the ICT sector, Nigeria does not yet have a strong regulatory framework and has weak state capabilities to enforce regulations. Additionally, though there have been efforts at the national level to improve ICT-related infrastructure, the full effect of such efforts has not yet manifested itself.

## Recommendations

**Improve and expand access to ICT-specific education.** The core inputs for the development of ICT services are ultimately ideas and human capital. As such, the availability and access to talent that can develop and operate various service platforms is absolutely key for the future development of the Lagos ICT cluster. In light of this, it is worrying that this has been identified as a key constraint for ICT services companies. While the business model of local ICT success story Andela is based around sourcing programming talent from around the African continent, if Lagos as a city and Nigeria as a nation wish to thrive off ICT services, they will ultimately have to develop homegrown talent. The deficiencies in this regard have already led key players within the Lagos ICT cluster to take pro-active initiatives by partnering with public and other private actors to ensure that educational bodies provide relevant training for the sector. This type of partnerships needs to be maintained and strengthened if Lagos is to continue developing as an ICT hub. If the government is forced into undertaking fiscal consolidation measures to shore up the public finances it also important to seek to protect those areas of the budget, such as education, that build future competitiveness.

**Liberalize the foreign exchange market.** The segmented structure and unclear foreign exchange framework around the exchange still create significant distortions and uncertainty for any player reliant on outside sources of financial or physical inputs. As we have seen this is a major impediment for Nigeria's mobile service providers. While a free float would entail an even weaker official Naira exchange rate, many actors in the economy are already forced to pay similar rates on the black market. A full liberalization would thus level the playing field and remove investor uncertainty about possible government distortions in the market. The impact of foreign exchange liberalization would of course have an impact that is not limited to investments in ICT infrastructure, but should generally make Nigeria a more attractive investment destination.

**Improve conditions to upgrade/expand ICT infrastructure.** While the state of both fixed and mobile internet connections is arguably relatively advanced in Lagos as such, this is less so in other parts of the country, limiting the potential of ICT services firms to fully exploit the vast size of the Nigerian market. Liberalizing the foreign exchange market should help retain the major, foreign mobile service providers in the country, and allow them to invest in upgrades of their technological platforms. Funding issues was one reason why the MTN Group was the only bidder at the mobile spectrum auction in 2016. But as the auction in itself had been postponed for almost two years, this suggests a need for the Nigeria Communications Commission to improve its own processes for freeing up and allocating spectrum to market participants.

**Increase cooperation in the ICT ecosystem.** Cooperation between the government, large enterprises, and start-ups will be vital to understanding and addressing the main barrier so to competitiveness. While intermediaries like CcHub are already improving communication and coordination, more could be done to bring together the different actors of the ecosystem. For instance, the government could arrange regular meetings between the heads of different agencies as well as CEOs of leading companies and start-ups to discuss regulatory bottlenecks.

**Collaborate more with the diaspora.** CcHub has started to organize hackathons for Nigerian solutions abroad, starting with London. Similarly, many of the local mobile operators have organized hackathon competitions – but the government is lagging behind. The government could play a more prominent role, through facilitating connections or even providing seed money or scholarships.

**Improve the relevant regulatory framework.** By all accounts, the regulatory framework in terms of for instance intellectual property rights and personal data protection is unsuited for the digital age. This concerns both the failure to introduce or update key pieces of legislation such as the Copyright Act and the Data Protection Bill, and the also the failure to enforce those laws when infringements do occur. The Nigerian government should work to improve their record on both these counts.

## Bibliography

- Carvalho, S., Ohuocha, C., 2017. Abu Dhabi's Etisalat wants Nigerian debt deal before sells stake. Reuters.
- Center for International Development, H.K.S., 2017. What did Nigeria export in 2014? [WWW Document]. The Atlas Of Economic Complexity. URL [http://atlas.cid.harvard.edu/explore/tree\\_map/export/nga/all/show/2014/](http://atlas.cid.harvard.edu/explore/tree_map/export/nga/all/show/2014/) (accessed 5.1.17).
- CIA, C.I.A., 2017. The World Factbook [WWW Document]. URL <https://www.cia.gov/library/publications/resources/the-world-factbook/rankorder/2004rank.html#ni> (accessed 5.1.17).
- Cotterill, J., Fick, M., 2016. Nigerian senators accuse MTN of foreign exchange violations. CTA, 2016. Youth, e-agriculture, entrepreneurship. ICT Update.
- Dalberg, 2014. ICT, Innovation, and Competitiveness in Nigeria - Examining Vision 20:2020 Goals through the Lens of High Growth Sectors and Critical Infrastructure.
- EIU, E.I.U., 2017a. Country Report - Nigeria 2017.
- EIU, E.I.U., 2017b. Industry Report - Telecommunications - Nigeria 1st Quarter 2017.
- Eleso, T., 2017. Building the Nigerian Tech Ecosystem – Improving Infrastructure for access & addressing talent shortage : Growth Capital Fund [WWW Document]. URL <http://gc.fund/building-the-nigerian-tech-ecosystem-improving-infrastructure-for-access-addressing-talent-shortage/> (accessed 4.12.17).
- Fick, M., Cotterill, J., 2017. MTN: What next for Africa's \$17bn telecoms group? Financial Times.
- Filani, M., 2012. The Changing Face of Lagos - from Vision to Reform and Transformatoin. Cities Alliance.
- Government of Nigeria, 2009. Report of the Vision 2020 National Technical Working Group - Information and Communication Technology.
- Government of Nigeria, K., 2013. Nigeria's National Broadband Plan 2013 - 2018.
- IDAL, 2015. The ICT Market in Nigeria 2015.
- IMF, I.M.F., 2017. 2017 Article IV Consultation - Press Release; Staff Report; And Statement by the Executive Director for Nigeria (No. IMF Country Report No. 17/80).
- International Trade Administration, 2016. Nigeria - Protection of Property Rights | export.gov [WWW Document]. URL <https://www.export.gov/article?id=Nigeria-Protection-of-Property-Rights> (accessed 5.3.17).
- ITU, 2016. 2016 Global ICT Development Index [WWW Document]. URL <http://www.itu.int/net4/ITU-D/idi/2016/#idi2016countrycard-tab&NGA> (accessed 5.3.17).
- Jackson, T., 2017. Lagos is Africa's most valuable startup ecosystem [WWW Document]. Disrupt Africa. URL <http://disrupt-africa.com/2017/03/lagos-is-africas-most-valuable-startup-ecosystem/> (accessed 4.12.17).
- Kazeem, Y., 2017. Lagos is Africa's 7th largest economy and is about to get bigger with its first oil finds. Quartz.
- Lagos State Government, M. of E.P. and B., 2016a. Y2017 Budget Proposal, Annexure I.
- Lagos State Government, M. of E.P. and B., 2016b. Y2017 Budget Proposal, Annexure II.
- Library of Congress, 2008. Country Profile: Nigeria.
- Main One, 2016. Company Brochure - Lagos.
- Mulligan, G., 2017. \$160k funding on offer at Lagos DealDay [WWW Document]. Disrupt Africa. URL <http://disrupt-africa.com/2017/02/160k-funding-on-offer-at-lagos-dealday/> (accessed 4.12.17).
- Myers, J., 2016. These are Africa's fastest-growing cities [WWW Document]. World Economic Forum. URL <https://www.weforum.org/agenda/2016/05/these-are-africa-s-fastest-growing-cities/> (accessed 5.1.17).
- Odufuwa, M., 2012. Understanding what is happening in ICT in Nigeria. Research ICT Africa and University of Cape Town.

- Okonji, E., 2016. Nigeria: The Untold Story of NCC's 2.6GHz Spectrum Auction. This Day (Lagos).
- Oxford Business Group, 2016. Growing ICT uptake in Nigeria along with robust state support sees technology sector expand [WWW Document]. Oxford Business Group. URL <https://www.oxfordbusinessgroup.com/overview/switched-growing-ict-uptake-and-robust-state-support-point-technology-sector-expansion-0> (accessed 5.3.17).
- Porter, M., 2013. Building a Competitive Nigeria: The Role of the National Competitiveness Council of Nigeria.
- PwC, 2015. Lagos: City of Opportunities - An Investor's Guide.
- Soobadoo, R., 2017. Meet the start-up leading the Nigerian technological boom. Dispatch Weekly.
- Startup Genome, 2017. Global Startup Ecosystem Report 2017.
- Transparency International, 2015. Nigeria's corruption challenge [WWW Document]. [www.transparency.org](http://www.transparency.org). URL [https://www.transparency.org/news/feature/nigerias\\_corruption\\_challenge](https://www.transparency.org/news/feature/nigerias_corruption_challenge) (accessed 5.3.17).
- World Bank, 2017. World Development Indicators | DataBank [WWW Document]. URL <http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators#> (accessed 5.1.17).
- World Bank, 2014. International Development Association Program Document for a Proposed Development Policy Credit - Second Lagos State Development Policy Operation.
- World Economic Forum, 2016. The Global Information Technology Report 2016.