Microsoft

Enabling a Digital Nigeria

A Position Paper of Microsoft's Vision for Digital Transformation and a Digital Economy that Works for Everyone

The ubiquity of technology and the Fourth Industrial Revolution is revolutionizing business and society in everyday life. The transformational changes of technology addition and the Fourth Industrial Revolution impacts social, economic, political and security dimensions.

For Microsoft, our global mission is 'to empower every person and every organization on the planet to achieve more'. In Nigeria, we are actualizing this mission daily by empowering Nigerians with technology solutions and building human capacity; but this alone is insufficient. Despite global expansion and increased access to technology, the benefits of technology are yet to reach the people who require it most - those in poverty, people with disabilities and those with inadequate digital skills. This is a concern for many governments today. However, with deliberate actions and strategies, the opportunities of digital transformation can support the social and economic development initiatives of governments.

In this position paper, we present digital transformation as a means for social and economic development in Nigeria to enable every Nigerian citizen and business achieve more. We recommend twenty (20) policy interventions across four (4) policy areas for the Government to promote a digital Nigeria in such a way as to optimally harness the opportunities of the fourth industrial revolution.

The recommendations highlight the gaps that need to be closed to ensure we can capitalize on the benefits of the digital economy. Transforming Nigeria using technologies will require developing a digital ecosystem, infrastructural enhancements in the policy and regulatory environment, education sector and national security. Finally, without deliberate efforts to improve people's national digital awareness and inclusion, both in the private and public sectors, the benefits will be limited.

We hope this contribution will provide a roadmap for Nigeria to achieve social and economic development goals and derive her share of the $11.5 trillion global digital economy.

For Microsoft, our global mission is 'to empower every person and every organization on the planet to achieve more'

FEDERAL MINISTRY OF COMMUNICATIONS AND DIGITAL ECONOMY

Leveraging Digital Technology for National Economic Development

I am delighted to write the foreword to Enabling a Digital Nigeria: Microsoft's Recommendations for Digital Transformation and a Digital Economy that Works for Everyone. The relevance and importance of digital initiatives are no longer just good to have, rather they have become critical; they align with Nigeria's Economic Recovery and Growth Plan (ERGP) as demonstrated by the contribution of the Information and Communications Technology (ICT) sub-sector to the Gross Domestic Product (GDP).

In securing our future, the Federal Ministry of Communications and Digital Economy (FMoCDE) launched the National Digital Economy Policy and Strategy (NDEPS) for a Digital Nigeria to reposition the Nigerian Economy to take advantage of the inherent opportunities afforded by digital technologies. This forward-looking contribution of Microsoft aligns with the 8 pillars contained therein and is a clarion call for the entire government to collaborate towards the building of an inclusive digital economy or Digital Nigeria, as we have termed it. Such a plan will enable national digital transformation and encourage government's adoption of technologies with long-term benefits to Nigeria in a manner that ensures inclusive delivery, responsible deployments and sustainable development.

The alignment of the 20 recommendations proposed in this document with the 8 pillars in the NDEPS confirms that the possibility of attaining a Digital Nigeria is not beyond reach. Some of the ways that this alignment is reflected include the following:

- Digital regulatory and policy evolution - the development and convergence of existing regulations as pertaining to the digital economy aligns with recommendations in the Developmental Regulation Pillar;
- The digital upskilling of Nigerian citizens aligns with the Digital Literacy and Skills Pillar;
- The infrastructural requirements fora digital Nigeria are an imperative identified in the Solid Infrastructure Pillar;
- The services to drive a digital economy are articulated in the Service Infrastructure Pillar;
- Promoting digital services across Nigerian SMEs are articulated in the Digital Services Development and Promotion Pillar;
- The application of digital technologies impacts social and economic development indicators aligns with the Digital Society and Emerging Technologies Pillar; and
- Building a Digital Nigeria entails the production of a sustainable digital enterprises in a thriving technology ecosystem as articulated in Pillar 8 - Indigenous Content Development and Adoption.The Nigerian government appreciates this contribution that will complement the successful implementation of a truly Digital Nigeria.

Dr Isa Ali Ibrahim (Pantami), FNCS, FBCS, FIIM, MCPN
Honourable Minister Federal Ministry of Communications and Digital Economy
April 2020

Microsoft in Nigeria

Microsoft's presence in Nigeria dates to 2000. From a software company, Microsoft's business has evolved through its partner and support network, offices, employees and programme initiatives. To date, Microsoft's presence has now expanded to include the African Development Center and two offices in Lagos and Abuja.

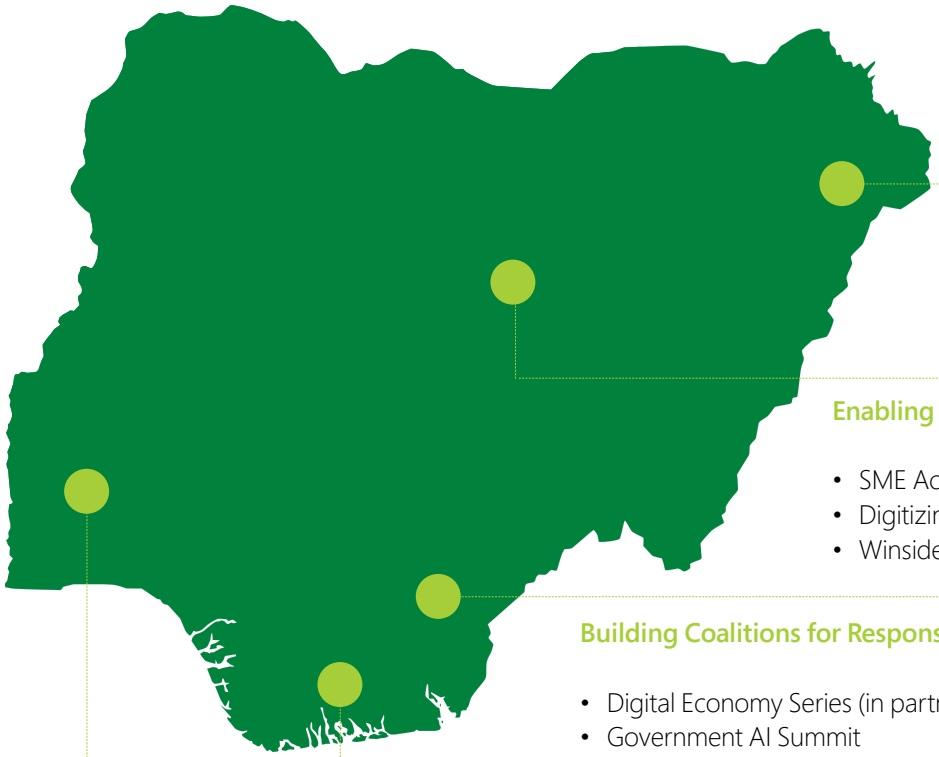
In 2019, Microsoft launched the African Development Center (ADC) - Microsoft Engineering. It is a premier center of engineering - recruiting world-class Nigerian talent to create innovative solutions for global impact. The center, which is Microsoft's 7th globally, is recruiting world-class African engineering talent to develop innovative solutions that span the intelligent cloud and intelligent edge. The ADC is a single development center with initial sites in Lagos, Nigeria and Nairobi, Kenya. The ADC will initially be housed within existing Microsoft offices in both Lagos and Nairobi but expand to new purpose-built facilities. The Microsoft Cognition and Microsoft Windows' teams have kick started the ADC efforts, focusing on AI-enabled cloud services, mixed reality experiences and rich applications that power the intelligent edge without disruption.

The ADC will afford Nigerian talent the opportunity to work on cutting-edge technology suitable for Nigeria and the rest of the world, reinforcing the country's position as a leading regional digital innovation hub. To support the development of these required skills, Microsoft is also partnering with local universities to create a modern intelligent edge and cloud curriculum, unique to Africa. Engineering graduates from top Nigerian universities will have access to the ADC to build relevant and meaningful careers in data science, AI, mixed reality, application development and more. By the end of 2019, Microsoft intends to recruit 100 full-time engineers across the two ADC sites, with plans to increase the headcount to more than 500 engineers by the end of 2023. We intend to keep this workforce largely Nigerian.

The ADC is the latest in Microsoft's ongoing investments in Africa, enabling digital transformation, bridging gaps in infrastructure, connectivity and capability while creating sustained societal impact on the continent. In addition to the already existing Microsoft office and the ADC, Microsoft in partnership with Tek Experts has a Customer Support Center in Lagos with over 1000 engineers supporting Microsoft customers around the world.

In 2019, Microsoft launched the African Development Center (ADC) - Microsoft Engineering

A snapshot of Microsoft's impact in Nigeria is summarized below



Bridging gaps in Infrastructure, Connectivity and Capability

- African Development Centers (ADC)

Enabling Digital Transformation

- SME Acceleration
- Digitizing the Legal System
- Winsiders4good Fellowship

Building Coalitions for Responsible Innovation

- Digital Economy Series (in partnership with Lagos Business School)
- Government AI Summit
- Winsiders4good Fellowship

Creating sustained social impact

- Device Donation
- Employee Volunteering Program
- AI for Earth Grant
- Cloud & Software Donations to Nonprofit
- Cash & Technology Grants
- Grants: Cash, Technology and Airband

Closing the skills gap and enhancing employability

- Coding for Employment (In Partnership with the African Development Bank)
- DigiGirlz
- Accelerate Labs
- Basic Digital Education Initiative
- Imagine Cup
- AppFactory
- Tek Experts
- Nigerian Women Techsters

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Background

Our daily lives revolve around technology, and it's changing ultrafast. Technology advances in medicine, education, communication, and productivity have increased life expectancy around the world and lifted hundreds of millions of people out of poverty. The ability to connect to people and information has now become commonplace and is transforming economies, businesses and society. To harness these opportunities, governments around the world are transforming and adapting to this technology revolution.

The Fourth Industrial Revolution

Advancements across physical, digital and biological domains characterize the Fourth Industrial Revolution. Physical innovations such as autonomous vehicles (AVs), 3D printing, advanced robotics and new materials demonstrate new production capabilities. Technologies such as the internet of things (IoT), digital platforms, cloud computing, data analytics, artificial intelligence, blockchain technology and its use in crypto currencies form the digital domain. Biological innovations include advancements in diverse genetic engineering techniques (for example, genetic sequencing and gene editing). The Fourth Industrial Revolution and its potential to transform the world has implications on public policy across social, economic, political and security dimensions. Table 1 highlights these implications.

The Fourth Industrial Revolution and its potential to transform the world has implications on public policy

Table 1: Potential Implications of the Fourth Industrial Revolution

	Impact Period/ Timing	Social implications	Economic implications	Political implications	Security implications
Internet of Things (IoTw)	Immediate - medium term	Privacy		Sensitive data migration overseas	Cybersecurity Online fraud & scams
Digital Platforms	Immediate- medium term		Business disruption [Technological] unemployment	Sensitive data migration overseas	Cybersecurity Online fraud & scams Online fraud & scams
Cloud computing	Immediate - medium term		Business disruption [Technological] unemployment	Sensitive data migration overseas	
Distributed ledger/ blockchain technology (DLT)	Immediate - medium term		[Technological] unemployment		
3D Printing	Immediate - medium term		Business disruption [Technological] unemployment		Weapons proliferation Cyber-sabotage Terrorism
Big Data/ Data analytics	Immediate - medium term	Privacy	[Technological] unemployment	Sensitive data migration overseas	
Drones	Medium-term		Disruption of traditional logistics businesses Monopolies [Technological] unemployment	Dependence on one or two sources for necessities.	Espionage Terrorism Trafficking Smuggling
AI & Robotics	Medium-term	Income inequality Artificial stupidity Addiction (gaming) [Technological]	[Technological] unemployment	Bias (racism, xenophobia) Instability	Cybersecurity Artificial stupidity

The strategic objectives of the Nigerian Government as highlighted in the Economic Recovery Growth Plan (ERGP) are to:

1. **Restore growth**
2. **Invest in people**
3. **Build a globally competitive economy.**

To achieve this, the Government's key priorities are to stabilize the macroeconomic environment, achieve agriculture and food security, ensure energy sufficiency (power and petroleum products), improve transportation infrastructure and drive industrialization focusing on small and medium sized enterprises (SMEs). Technology can therefore serve as an enabler to drive these initiatives. The challenge for law makers and policymakers around the world is how to harness the power of the technology to transform people's lives for the better without unleashing the potential for dislocation and disorder.

For Nigeria, combining the achievement of her strategic goals and balancing technology is a daunting task. This challenge raises fundamental questions when making laws about how to strike the right balance between competing interests such as: public safety and the right to privacy; how to recognize national sovereignty without restricting the efficient flow of information across international borders; and how to provide entrepreneurs and innovators with the freedom to create, disrupt and transform while ensuring that the benefits of change are shared.

Digital Nigeria

At Microsoft we ask, "how we can bring to life the promise of technology for everyone?" Part of the answer is the recognition that empowerment begins with digital inclusion. Just as there is an effective commercial ecosystem that brings the promise of technology to life in the marketplace, there must also be a strong societal ecosystem that democratizes the promise of technology to life.

In this position paper, we present digital transformation as a means for social and economic development in Nigeria to enable every Nigerian citizen and business achieve more.

We also recommend policy, technological and other interventions for the government to promote a digital Nigeria that can harness the opportunities of the fourth industrial revolution.

We highlight relevant key technology trends/issues and outline policy recommendations pertaining to each of them and shed critical insights on key enablers for maximizing value from technology. We also recommend adaptable best practices from proximate cloud-first jurisdictions focusing specially on the public sector and elaborate on some inspiring digital transformation case studies emerging from select sectors in Nigeria.

For critical areas such as the public sector – with its legacy complex and bureaucratic processes – "making the right choices to improve their digital 'readiness' is the first building block of any digital transformation strategy".

This will require visionary leadership and commitment at all levels to harness optimally the valuable opportunities of digital transformation. It is also important to understand adequately the challenges that come with a digital transformation journey as they intersect with our unique cultural milieu, as well as our policy and regulatory framework readiness for digital transformation.

In summary, this is a roadmap to aid the Nigerian government navigate the Fourth Industrial Revolution and leverage its innovative technologies for a viable digital economy within a sustainable and realistic framework that is inclusive, enabling and empowering, safe and secure.

Digital Transformation

Technology is transforming business and societies. In the business context, this transformation is as a result of the use of technologies to enable business improvements. The technologies warrant organizational changes to the structure, people, culture and processes, among others and evolution a digital ecosystem. In the social context, digital transformation is about the societal changes that occur through applying technology in our everyday lives. Hence, technology brings about the change of entities (businesses and governments), people and objects. Depending on the context, the change may be economic (financial, production, models and methods) or behavioral (impacting the way we work, live or interact with each other).

Leapfrogging on the Wings of Digital Transformation: Opportunities and Challenges

Innovative technologies are transforming traditional economies into fast-growing and more inclusive digital economies. In Africa, Nigeria stands at a pole position in leveraging this change - being the continent's most populous nation with the largest technology and mobile market. This is evident in the growth of recognized e-commerce and mobile-based enterprises. However, daunting challenges impeding the growth of this ecosystem exist. These include inadequate technology infrastructure, scarcity of skilled digital natives and more the highest commitment levels by government at all strata in driving the nation's digital transformation agenda.

Digital Transformation Challenges

Beyond implementing technology solutions, digital transformation is also a people-centric phenomenon. Barriers to effective digital transformation vary from individual, organizational or institutional perspectives.

A strategic digital mindset, not technology, drives an effective digital transformation journey.

This requires new thinking about governance enabled by a digital culture to realize the imperatives of crafted digital strategies. Individuals responsible for digital transformation require strategic leadership and implementation skills that support the delivery of the vision in alignment with other objectives. In corporate organizations and government institutions, barriers include the workforce demography (and their digital capabilities), costs, bureaucracy and transformation fatigue. Institutional barriers common to the environment encompass infrastructure deficits, and a thriving digital ecosystem with enough talent and competencies to drive digital transformation initiatives responsibly and sustainably. The benefits realizable are enormous and include enhanced efficiency of government processes, increased transparency and accountability, and enhanced revenue administration.

Benefits of Digital Transformation

Economic Diversification

Industrialization brought about developments in areas such as mobility and transportation, electrification and mechanized agriculture that redefined economic systems. Nigeria's discovery of oil in the 1960s and the influx of oil exploration and other extractive industries resulted in a decline in the primary source of economic activity - agriculture - in favor of oil. Nonetheless, agricultural developments continued, albeit at a slower pace of evolution and development. With declining global oil reserves, alternative forms of energy and sustainable development goals (SDGs) and calls for cleaner energy sources, the global influence of oil is reducing. As an economy reliant on income from crude oil sales, Nigeria's vulnerabilities and lack of economic stability have resulted in calls for economic diversification. In recent times, the revitalization of the agriculture industry is one of the driving forces. Yet, the digital economy is also a viable source of economic diversification that provides a skilled and talented workforce that can serve a global community through freelancing, micro-work, business process outsourcing (BPO) and other opportunities.

National Competitiveness

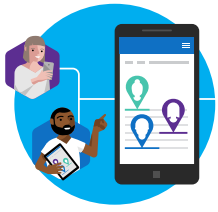
Because of globalization, economies and markets are interconnected by transnational systems and networks. Global networks such as the internet enable the flow of digital resources and support flat network organization structures comprising diverse global talent. Within such economic structures, employees can conduct work activities in different locations on the globe. Capitalizing on such phenomena, India, for example, could create an outsourcing industry as part of its digital transformation. Nations are therefore building digital capabilities as a source of national competitiveness.

Some use case examples are highlighted below::

Business process outsourcing (BPO) in India

India's BPO Industry has evolved from basic process outsourcing to higher-end Business Process-as-a-Service (BPaaS). This end-to-end offering improves work process productivity and efficiency by leveraging innovative digital technologies such as artificial intelligence, robotics, automation and big data analytics.

In 2018, The Customer Service and Support (CSS) Center was established in Lagos by Microsoft in partnership with Tek Experts. The center collaborates with the local tech ecosystem in developing talent and skills within the region in the key areas of software support, training and education, customer success, sales and application development. This initiative is raising the profile of Nigeria as an exceptional location for technical resource in the era of digital transformation. Within the center, Microsoft through its partner has hired over 1000 people in Lagos as customer support representatives for Microsoft customers all around the world.



The Outsource Global Team is IAOP-compliant commercial call Centre in West Africa, and the first Nigerian international call Centre serving the UK & US markets. They are a 100% Nigerian group deploying best-in-class technology to meet the needs of clients. Their solutions are at the cutting edge of contact center business process outsourcing and they have developed a deep vertical expertise and unique understanding of industry-specific needs, Abuja and Kaduna.

Productivity

Effective communication systems and the digitization of business activities improve information flows that drive efficiency and productivity. According to the National Bureau of Statistics, the contribution to GDP of the sub-sector - information and communication - as of Q2, 2019 stood at 13.8 percent. While this direct contribution is clear, the enablement and digital transformation of other industries will also produce increases in productivity. Examples of these include market information systems providing access to markets for farmers, electronic diagnostic systems for universal healthcare provision and digital classrooms and massively open online courses (MOOCs) for improved access to education.

Innovation

Innovation refers to the creation of new methods, ideas or products. Digital technologies have encouraged enterprise innovation through new business models and products.

Such transformations have created a new class of businesses transforming industries through innovative solutions and business models. Examples of these include fintech in financial services, agritech in agriculture, edutech in education, and so on. These businesses are using digital technologies to creatively present products and services that address social and market tensions in the industry value chains.

A case in point from the financial technology (Fintech) industry is Paystack that has built a payments system that allows merchants accept secure payments from local and global channels. By exposing African businesses to global markets, Paystack helps businesses grow. Additional evidence of this innovation is in the financial services industry where deployments such as instantaneous inter-bank transfers and account name lookup are still not available in more developed financial services markets.

Job Creation vs. Job Elimination

Job elimination is one of the adverse threats of digitalization that is being mitigated through innovative businesses discussed earlier. While some jobs are subject to technological elimination (see Table 1), new jobs that did not previously exist, are being created; albeit with different skill sets. However, the pace and rate of change of these two trends depends on the actions taken in one's digital transformation journey. Futurum's 2018 Digital Transformation Index report shows that digital transformation is not eliminating as many jobs as presumed. 37 percent of the companies interviewed confirmed that digital transformation helped them create new jobs.

The World Economic Forums (WEF) – 2018 Future of Jobs Report also showed that 38 percent of businesses expect to extend their workforce to new productivity-enhancing roles,

and more than a quarter expect automation to lead to creating new roles in their enterprise. The WEF report emphasized that by 2022, the growth in emerging professions will increase to 27 percent from 16 percent. One set of estimates shows that a shift in the division of labor between humans and machines may displace 75 million jobs, while 133 million new roles that are more adapted to the new division of labor between humans, machines and algorithms may emerge. For emerging economies with younger populations - such as Nigeria - sustaining increase in GDP per capita will rely on growth in the working-age population, supported by productivity-raising measures like automation and digitization. This will help in creating digital jobs without necessarily replacing already existing ones.

When we think about job displacement, our minds often go to factory workers and call centers, but as leading artificial Intelligence expert Dr. Vivienne Ming points out in a recent interview with the Financial Times, the middle class in professional services may be the challenged in this computed future. Ming cites a recent competition at Columbia University between human lawyers and AI counterparts reviewing agreements with loopholes.

The AI lawyer found 95 percent of them in 22 seconds, while it took the humans over an hour. As a lawyer reading this, two conflicting emotions arise: one is concern, but the other should be joy that life is about to get easier; free of the day-to-day drudgery of reviewing agreements and allowing you to concentrate on what matters. This is what technology does - it's an advantage to complementary skills. In addition to creating a workforce to complement technology advancements, channeling the efforts of unemployed youths (typically digital natives) into digital entrepreneurship to develop innovative indigenous solutions and mature the technology start-up ecosystem is needful.

Social Impact

Technology has a significant effect on our behavior. It's ability to meet innate human needs - psychological, safety, belonging, esteem and self-actualization - explains this impact. Even though there is no technological alternative for essentials like food, water and shelter, technology components such as battery, Wi-Fi and internet access are becoming equivalents. The prevalence of online connectivity and digital communications calls for an increased need for online safety, security and privacy.

Community platforms like Facebook and other personal social networks enhance our sense of belonging to larger global communities.

Moreover, the ability to self-publish content - blogs and e-books - asserts confidence, a sense of achievement and esteem. In addition, access to information and knowledge online has enhanced learning abilities. Technology is driving the ability to express opinions, leading to increased levels of participation in civic protests. For example, leaderless social activism such as the YellowVest protests in France, Occupy Wall Street and the Arab Spring are now commonplace.

Evidence-based Decision and Policy Making

Data and data analysis systems are a new asset category that are being created and captured in multiple interactions and instances. These data flows are created from internal e-government systems with the automation of government processes. In addition, data flows that originate from sensors on industrial equipment (industrial internet of things (IIoT)), wearables (internet of things (IoT)), emoticons and so on, create vast stores of structured and unstructured data. The analysis of these data sets provides new insights for business and government institutions, enhances their ability to make better informed decisions and aids policy formulation and improvement.

Efficiency

The efficiency contribution of digital transformation to business activities generates savings of time and money and enhances trade flows.

For instance, emailing or attending a video conference in Nigeria's economic capital, Lagos State, saves travel time. Increasing financial flows though digital payments can reduce tensions in value chains and enhances physical flows of goods and services. In addition, social media platforms like Instagram improve access to markets for micro and small enterprises.

Enabling a Digital Nigeria

The transformational benefits of technologies are clear. For Nigeria to reap these benefits, the active engagement of all levels of government is imperative. To enable national digital transformation, we encourage government to first adopt technologies with long-term benefits to Nigeria and ensure these technologies are:

1) Delivered inclusively
2) Deployed responsibly
3) Provided safely and securely

Adopt Technologies with Long-term Benefits

Among the diverse range of digital technologies, we identify two transformational technologies which if adopted, can produce long-term economic and social benefits. These are cloud computing and artificial intelligence (AI).

Cloud Computing

Cloud computing involves the dynamic delivery of hosted digital services over the internet, achieving the highest efficiency for scaling, reliability, traffic flexibility and demand response time.

Cloud service models support physical IT resources - software, infrastructure and platforms. Software-as-a-service (SaaS) cloud systems provide access to software applications stored on remote services through a thin client (web browser). Platform-as-a-service (PaaS) deployment provides technology developers or providers runtime or integrated development environments that support their ability to offer services to consumers.

Deploying physical computing resources in such a manner is infrastructure-as-a-service (IaaS). Cloud architecture can deliver off-site hosted services to enable customers' use of third-party digital resources or just enabled as a virtual environment for specific enterprises. While the former design makes for a public cloud, the latter is a private cloud environment. Public cloud design does not mean that hosted data is available in the public domain; rather it provides the most cost-effective digital solution for hosted services based on scale economics.

Benefits of Public Cloud

The economic leverage that public cloud adoption provides is critical upfront savings from capital expenditure on information technology (IT) infrastructure as 75 percent of IT expenditure supports legacy system maintenance and routine upgrades. More so, the economies-of-scale efficiencies that public cloud provisioning avails lead to other technology infrastructure deployments as well as operational and maintenance costs. These factors free up budget funds for investment in pressing areas as they impact the country's overall socio-economic development, with spillovers for start-ups and small and medium enterprises (SMEs) as it concerns market entry barriers in emerging markets. In the full cycle, this will have the transformational macro-economic impact of creating more job opportunities, leading to economic recovery and growth.

Organizations adopting public cloud services could incur lower energy costs associated with electrical power consumption and cooling.

The flexibility of a subscription-based on-demand technology service in an emerging market can catalyze innovative business models that disrupt traditional business ecosystems in the private sector, enhance cost-efficiency in the public sector and create many social welfare opportunities.
Adopting public cloud across industry sectors can engender a more inclusive socio-economic development by providing scale platforms for education (remote classrooms), financial services, entrepreneurship (skills database), healthcare (tele-medicine), agriculture and e-governance to the unserved and under-served areas.

Cloud in Nigeria

Cloud computing adoption has been sub-optimal in Nigeria, notably in the public sector. Bridging this divide is imperative for modernizing the nation's public sector, while maximizing the benefits of e-government and e-governance. Although the Nigerian government has overcome some of the fears associated with cloud adoption across MDAs, public sector-wide cloud adoption remains in its infancy.
For Nigeria, cloud computing migration will catalyze the digital transformation of public institutions leading to more efficient e-governance models that rely on an integrated database complementarity for maximum citizen welfare.

Implementing the Nigerian Government Enterprise Architecture (NGEA) is also very dependent on a public cloud computing friendly environment.

Cloud-First Policy

In August, 2019, NITDA issued the Nigeria Cloud Computing Policy (NCCP) with the goal of ensuring 30% increase in adoption of cloud computing by 2024 among Federal Public Institutions (FPI) and Small Medium and Enterprises (SMEs) that provide digital enabled services to the government; and 35 % growth in cloud computing investment.

Despite the growing acceptance and awareness of the benefits of public cloud deployments by both the public and private sector stakeholders in Nigeria's technology ecosystem, the perception around data security and privacy remain critical challenges that stand in the way of cloud adoption. Regional and national regulatory bodies are introducing laws and policy guidelines to address this challenge.

One of such policy requirements which have garnered considerable debate centers on data localization.
As data security is not a direct function of the hosting and processing location because of varying legal and compliance obligations, arguments for a blanket data localization policy might be flawed and lead to increased vulnerabilities in hosting data within a single national boundary.
This jurisdictional challenge compounds the arguments against data localization given the technology for public cloud computing relies on a connected physical infrastructure, with data transiting across borders. That said, a distributed data infrastructure complements data security and privacy.

On the critical need for job creation in emerging markets, as most domestic technology players are yet to attain maturity, data localization policies within these markets might produce sub-optimal results. Most firms rely on imports for their technological inputs, as such, data localization will pile on more macro-economic pressure with the rising demand for scarce foreign exchange. More so, considering global scale advantages, the possibility of higher prices by local players who may become deprived of cost-effective solutions provided by several global players will become rife as transaction costs escalate; operating in environments with huge infrastructural gaps such as electric energy could then lead to further efficiency losses in the local economy.

A broad-sweeping data localization regime will impede the growth of the country's fledgling cloud computing industry in the long term;

limit realizing the potential benefits of public cloud computing adoption and the growth and diversity of the ICT ecosystem, including foreign direct investments (FDI). This is even more imperative in the Nigerian context, considering the infrastructural deficiencies of electric power supply and telecommunications penetration and quality, which pose significant impediments to the build-out of local data hosting facilities. From an economic standpoint, a blanket national data localization law will result in a managed rather than a free market model that will have serious implications for the country's competitiveness in attracting scarce FDIs in the ICT sector. This could mean that short-term gains from a blanket data localization regime may outrun the long-term gains by negative overall macro-economic impact of job creation and revenue generation.

Best practice: UK Government Cloud Leadership

The UK government's commitment to cloud computing adoption has focused on the G-cloud framework – started by the government and industry – targeting efficient procurements by public sector departments of cloud-based technology services as a first option. The intention was that adopting this policy would complement the government's efforts in enhancing operational standards, reducing IT project costs and improving data security. While there were initial adoption concerns regarding data security, the government established a framework to guide departments on modalities for reorganizing their work processes to leverage the cloud platform in such a manner as to minimize threats of sensitive data breaches. They also developed cloud security principles to guide public sector organizations on the security assessment of cloud services to make more informed procurement decisions in such a way as to balance security risks with cloud benefits.

Recommendation 1

Implement National Data Classification System: While the principle of data localization is a justifiable measure that considers data security and sovereignty concerns, there should be a more nuanced application of the concept. Within this purview, the National Cloud Computing Policy as developed by NITDA specifies a data classification framework that matches optimal data residency protocols with national policy objectives. There is the need to begin the implementation of this framework across the public sector as public institutions begin to migrate to cloud-based solutions.

Recommendation 2

Uniform Standards, Practices and Laws: To leverage the benefits of ICT and cloud,

it is imperative that the Government define ICT and cloud service management standards and practices.

This may be achieved by mandating adherence to global standards and practices, an emerging standard among independent data center operators. Such a task may require standards for data, transactions and data center operations and service level agreements (SLAs) to enforce compliance.

With cloud, the government will require to implement policies and frameworks for public sector ICT adoption. As such, there is the imperative for the implementation of the Nigeria e-Government Interoperability Framework (Ne-GIF) developed by NITDA across the public sector. Alongside these policies and frameworks are the oversight mechanisms that ensure compliance and the attainment of policy objectives. This process will optimize the government's role in driving sustainable development (such as job creation and human capital development) that impact macroeconomic growth.

Recommendation 3

a) Public sector ICT and cloud adoption: There is a need for the development and implementation of an ICT deployment plan and a technology-enabled public sector. This will direct efforts to more practicable outcomes that benefit many segments of the economy and population. To achieve this, the government may need to consider a centralized government architecture using shared services and fosters collaboration and cooperation among MDAs. Such a collaborative approach to service delivery will enable government agencies provide holistic services to citizens at the national and sub-national levels.

b) MSME ICT and cloud adoption: As of 2017, Nigeria's reported 41,543,028 businesses classified as micro, medium and small enterprises (MSMEs). Of this number, 99.824 percent (41,469,947 entities) are micro, 0.172 percent (71,288 entities) are small, and 0.004 percent (1,793 entities) are medium enterprises. Through digitalization, MSMEs can improve their data and information management capabilities, notably financial record keeping and reporting, and show deeper knowledge of their businesses to address their financing gaps through access to credit. In addition, digitization across this sector will interconnect enterprises and enhance their productivity, resulting in efficient supply chains that make markets more effective. Such capabilities will enhance the competitiveness of Nigerian entities in this era of globalization and the Africa Continental Free Trade Agreement (AfCTA).

Recommendation 4

Cloud Computing Architecture: The government's ability to deploy cloud computing models such as hybrid clouds is worthy of consideration. Such alternative cloud computing architecture allow for closer control as well as incorporating security and privacy features. A case in point is the G-Cloud - combining private and community cloud models - and offering superior compliance with national regulations and legislations than public clouds.

Recommendation 5

Digital leadership and support: Despite the herculean challenge required to change the perceived government lethargy towards digital transformation, the ingenuity and leadership of government MDAs' support for the successful implementation of digital initiatives and the digitalization of government processes are yet to become pervasive.

Recommendation 6

Digital awareness:To sustain the traction of a cloud-first policy and other digital transformation initiatives, Government efforts to increase digital and cloud capabilities of the public service are important. The Government should amplify communications of its commitment and support of ICT policies within an enabling environment. In addition, enhancing communications of exemplary use cases highlighting ICT deployments impacting government services is essential to increasing technology adoption and trust among the public sector entities.

Recommendation 7

Digital capability development: To sustain cloud and ICT adoption, the government needs to ensure that the requisite digital capabilities and skills for leveraging cloud and ICT investments exist among public sector employees. Hence, digitizing the work activities and developing the requisite digital skills and capabilities in current job roles requires civil service reforms. Implementing and building the digital capabilities requires market engagement regarding training on cloud-based work processes in the public sector. There also needs to be provision for engagement fora to address pertinent issues and cloud concerns.

In my experience working for the enabling legal environment for Ghana, one thing we did was to engage all the stakeholders' right from the beginning and try to address everybody concerned before it›s too late. I think this is a big lesson for Nigeria even in terms of the data protection bill which the President didn't assent to. Engaging all the stakeholders, the private sector, parliamentarians, the people in the Attorney General›s department that have to draft the laws, all key stakeholders that it may affect even in the government sector, you want to bring them around the table at the very beginning when you›re doing the work.

Teki Akuetteh Falconer, Founder and Executive Director, Africa Digital Rights› Hub and Former Executive Director of the Ghanaian Data Protection Commission

Artificial Intelligence (AI) is a driver for the Fourth Industrial Revolution, and developed economies are taking full advantage of AI technologies in making breakthrough advances in healthcare, education, transportation, and so on.

For example, in the health sector, AI can ease the lack of medical access for a large proportion of Nigerians by speeding up medical services and extending it to more patients, notably in rural locations. Doctors and other medical practitioners can leverage growing access to mobile devices as a tool for data collection, improving administrative efficiency and expanding treatment coverage. AI can support forensic analysis functions and help practitioners identify potential challenges in a timely manner and administer preventive care.

With access to electronic medical records, AI enables fast and more accurate diagnoses, improves and speeds up interpreting findings and suggests more accurate interventions. Nigeria, like most emerging economies, is yet to capitalize on AI despite its inherent opportunities because of low awareness. With the predicted prevalence of significant advancements relying on artificial intelligence, the government's regulation and oversight of the emerging issues such convenience and access versus data protection and privacy is becoming pertinent.

Recommendation 8

National AI Policy and Strategy: Nigeria requires a policy and national strategy for artificial intelligence. Providing a cohesive policy roadmap for channeling the potential of artificial intelligence is an important step in Nigeria's adoption of a data-oriented intelligent approach to combat socio-economic problems. We can achieve this through policy analyses - identifying context-specific requirements regarding amendments to existing policies or formulating a new policy.

Recommendation 9

a) Digital [AI] policy capacity development: Across different industries, diverse issues trail applying AI solutions (see Table 1). The body of knowledge requisite for developing inclusive and fair policies requires multi-disciplinary knowledge of the subject (AI technologies) and their multi-dimensional implications. Building AI knowledge centers across the country can bridge the gaps among policymakers and practitioners. Universities and research institutions are relevant actors in fostering an AI ecosystem.

University of Lagos AI Hub

The University of Lagos launched the first AI Hub in Nigeria in partnership with Data Science Nigeria (DSN). The Hub focuses on developing AI capabilities in deep learning and young talent development in data analytics. It is the first dedicated data science community/AI Hub in Nigeria with AI research tools for students. The Hub also has a minilab on AgroSensor Design – how to use AI to understand weather impact on farm yield and fraud detection lab that leverages crowdsourcing and textual analysis.

b) Digital Transformation Research: The government should enhance scientific research on the adoption and use of technologies such as AI, IoT and blockchain as well as the role and impact of digital tools in improving sectoral economic activity and overall quality of life for Nigerians. We can achieve this using existing funding mechanisms like the Tertiary Education Trust Fund (TETFund), private sector grants or by establishing a National Research Institute for Digital Transformation. The institute will aggregate knowledge through partnerships and engagements with various institutions of learning and the private sector to fund and promote research.

Recommendation 10

The government needs to optimize its data ecosystem to leverage AI and machine learning opportunities for social good in areas such as financial inclusion, universal healthcare and food security. The development and provision of multi-domain open data repositories will enhance citizen interaction and provide a platform for evidence-based decision and policy making. This will amplify the country's emergency response infrastructure and preparedness and resilience to crises or disaster situations.

Best Practice: Digital Transformation of the UAE public sector

Underpinned by the UAE Vision 2021 to transition to a knowledge-based economy, the public sector in the emirate is leveraging big data analytics to enhance performance and efficiencies and provide people-centric e-government services. This process is executed on an open data architecture anchored by the Dubai Data Establishment - facilitating seamless data exchange between the public departments and the private sector. The UAE ranked as the seventh-most competitive country on the World Competitiveness Yearbook 2018.

We should ask that what are the areas of focus that Nigeria as a country wants to consider itself an expert in and how do we develop our incoming students to make sure that when they graduate in four years or five years or however long it takes to get a graduate degree here that they come out being capable and ready to enter the workforce.

Gafar Lawal, Managing Director, Microsoft - Africa Development Centre - Nigeria

Delivering Technology in an Inclusive Way

Technology can connect individuals and businesses through communications networks and provide citizens with government services. Such inclusiveness reduces the cost of governance whilst ensuring that it serves every Nigerian citizen.

Connecting the Unconnected

Nigeria ranked 70 out of 79 countries surveyed in the 2018 Global Connectivity Index (GCI) of 2018. According to the report, 'a -1point increase in GCI score is equivalent to 1) a 2.1 percent increase in competitiveness, 2) a 2.2 percent increase in national innovation, and 3) a 2.3 percent increase in productivity'. The connectivity landscape in Nigeria shows that the most pervasive networks are still using 2G technologies, reaching about 90 percent of the population, while 3G and 4G coverage remain low. 3G coverage covers just about 25 percent of the population - in the state capitals - while 4G accounts for only about 2 percent of mobile data connections in the country.

Digital inequality in internet access persists with people in urban areas 21 percent more likely to have access than people in rural areas.

Even in some rural areas where coverage exists, quality of service can be very unreliable and unaffordable by many.

Therefore, for Nigeria to position to harness the opportunities of a digital economy, there is the critical need to strengthen mobile connectivity networks and internet access in both quantity and quality for unserved and underserved regions. These will form the bedrock for realizing the initiatives for effective e-service delivery and virtual work at both government and cross-sectoral levels.

Recommendation 11

Digital inclusion: : To ensure technology adoption for social good among the citizenry, the government should ensure technology adoption barriers like costs are fair to all socio-economic groups. This adoption of low-cost connectivity solutions like TV white spaces should be prioritized for rural areas, institutions of learning and community networks. In addition, Government support and provision of digital applications in sectors like healthcare and education will enhance the livelihood and wellbeing of all Nigerians. Regarding education, online learning at scale will not only bridge the education divide, but also address the contextual inadequacies in education access, provision and quality especially for underserved communities. More so, with a doctor-to-population ratio of 1:2500 in the country as against the World Health Organization (WHO) recommendation of 1:1000, mobile phone-based telemedicine solutions can close the gap towards an inclusive healthcare system.

Recommendation 12

To achieve digital inclusion, we recommend that the Government prioritize private sector participation in rural infrastructure development through incentive schemes like tax breaks and/or reduced import tariffs on network equipment and mobile device shipments. This should be connected to the enhanced stability for a resilient national infrastructure backbone as indicated in the Economic Recovery and Growth Plan (ERGP) of the Federal Government.

> One target underpinning the UN's strategic development goals (SDGs) is 'an ambitious goal to increase access to information and communications technology and strive to provide universal and affordable access to the interne
>
> **(United Nations, 2016)**

The Future of Work

Digital technologies and the digitization of business activities will have impacts on various aspects of business and society. The impacts on work or jobs as reported by the World Economic Forum's Human Capital Index, states that 46 percent of the current jobs in Nigeria will be susceptible to elimination through digitalization. While low labor costs will moderate this, new opportunities arising from the Fourth Industrial Revolution (4IR) in science, technology, engineering and mathematics (STEM) will also equalize the impact.

With a rank of 152 out of 157 countries on the WEF's 2018 Human Capital Index, Nigeria is not optimizing its human capital potential regarding adequate preparation for managing this ongoing and future disruption. Within this purview, while the country's educational systems must adapt to prepare the youth for the new world of work, current employees will also need opportunities to embark on capacity development and upskilling programmes to prepare employees for the workplace of the future.

A question on many governments' minds regarding AI is the future of work. What jobs will still exist come 2030? Will there be mass unemployment and how will we deal with it? Predicting the future is difficult. In a country like Nigeria where unemployment is already at 18 percent (that is about 16 million unemployed people) and a sizeable percentage of the population under 35, this calls for concern. The reality is many jobs will vanish but many more will emerge. As the gig economy continues to grow, many more jobs which require new skills sets will emerge. Governments should therefore focus on reskilling the workforce and creating a healthy learning economy to build the new digital work ecosystem. More so, as the gig economy is synonymous with remote working, this increases the potential for individuals to become self-sufficient with jobs offshored across the globe, especially in a country such as Nigeria with a huge unemployment burden. Furthermore, the opportunity of remote working is even more critical for the fledgling startup ecosystem in the country as these can easily access affordable freelancers to make most of their little or no capital.

Thus, governments should collaborate with businesses, technology companies, civil society and academic researchers to shape policies that will help realize the broad benefits of AI. This joint effort will ensure that we can identify and prioritize issues of societal importance as AI continues to evolve, enable sharing of best practices and motivate further research and development of solutions as new problems emerge. Policy solutions in this regard should also incorporate requirements of a reformed labor structure that assesses the elements of the virtual workplace and the virtual worker, while the corresponding critical infrastructure for the new economy such as reliable power and ubiquitous broadband connectivity must be accelerated in order not exacerbate the divide between the digital haves and the have-nots.

Recommendation 13

National curriculum review: Education is an integral pillar of a digital and knowledge-based economy. The national curriculum (at all levels) and delivery methods need to adapt and align with the realities of the 4IR and develop digital and non-digital skills like critical thinking and problem solving. In addition, globalization warrants preparing Nigerians to work in cross-cultural environments requiring skills such as emotional intelligence. Instructional methods need to become more practice-oriented and aligned with job market requirements from the foundational levels in educational institutions. Also, Nigeria needs to address distribution and delivery challenges and ensure learning is inclusive, that is, accessible to under-represented populations like women, girls and persons with disabilities via online delivery methods such as massive open online courses (MOOCs). Such a re-tooling exercise will allow Nigerians take part in the global online workplace available through freelance and micro-work platforms and the global contracting (business process outsourcing) economy.

> Governments and educational institutions should continue investing in digital skills by creating more technical colleges by partnering with organizations who can help train and build a local technology ecosystem. We need to identify what Nigeria's comparative advantage is over other countries, and what sort of labor force we should develop by paying attention to what people in our countries do well that machines cannot do. There also needs to be a shift in educational policies with an increased focus on vocational skills and other forms of certifications
>
> **Rimini Makama, Government Affairs Director, MEA Emerging Markets – Microsoft**

Proudly Made in Aba

In Nigeria, Abia State has recognized that vocational skills have a positive socio-economical effect; and has championed the 'Made in Aba' initiative which capitalizes on the 'can do entrepreneurial Nigeria spirit' to produce quality goods made in Aba for local consumption with a long-term goal for export. Other Nigerian states can easily adopt this model.

Digital Transformation in Government

The government is responsible for governance of a state or country. Milton Friedman states, "Government has three primary functions. It should provide military defense of the nation. It should enforce contracts between individuals. It should protect citizens from crimes against themselves or their property." Notwithstanding, the government also provides for public goods and services .

This burden of government is not only complex but requires volumes of data stored in different ministries, departments and agencies (MDAs). The full digitization of the Nigerian government is incomplete. It articulates the need for digitizing government activities in an e-government plan. Some MDAs have advanced in digital transformation initiatives, but the requisite structures and systems for a digital government are nascent and fragmented. Complementary benefits of cloud-based architectures like integrated end-to-end processes and seamless business flows across government functions and agencies should not be discounted.

Enabling Environment

Digital technologies are global and more advanced in industrialized economies in developed countries. Despite the leapfrog abilities showed in few emerging markets and developing economies, the depth of knowledge and know-how, research and development (innovation) capacity has created a gap. In reality, filling that gap requires implementing deliberate actions.

Over the years, the Federal Government of Nigeria has started or adopted several related policies and laws aimed at developing the ICT sector and harnessing its potential for national development. There is the need to re-assess these policies in line with the fast-changing technology ecosystem and its global convergence to ensure an optimal enabling environment for effective digital transformation. This will also require strengthening institutional [digital] capacities in the critical areas of cybersecurity, data protection and privacy, and cloud computing policies – maintaining the right balance between innovation and protectionism.

Technology Ecosystem Development

An effective digital transformation journey will require overcoming silo-thinking to drive collaboration across the technology ecosystem – government, private sector, civil society and academia – to harness unique ingenuities for data-driven opportunities. This will need structural changes to ensure open ecosystem collaboration beyond traditional remits.

> ...some critical pillars that I think is important from a transformation perspective; the government is the single largest provider of services to citizens and I think if you are going to think about a digital enablement or a digital economy for Nigeria, we need to look at where is Nigeria from a digital government perspective? Are citizens engaged? Are services online? Can businesses access permits and other license in other to do business in Nigeria? I would look at that as a critical pillar in terms of the enablement of E-government services because I think this again leads into many forms even with the data that the government collects from each one of us.
>
> **Angela Ng'ang'a, Education Lead, MEA Emerging Markets - Microsoft**

Deploying Technology in a Responsible Way

The potential benefits of technology require resources beyond finances to acquire digital assets. The IT productivity payoff is undermined by negative indicators like IT project failures, project cost overruns, and incomplete or abandoned projects that derive no digital outputs and outcomes, substantiating IT misalignment in business and society.

Digital Capabilities

Delivering technology benefits and digital transformation is often "constrained" by the quality of assets, resources and capabilities in developing economies like Nigeria. These constraints (Figure 2) impact adoption and sustainable use of technology in both in government and private sector entities and also the intended benefits.

We (government and processional ICT organizations) can lessen industry level constraints by developing (government and professional ICT organizations) and adopting best practice frameworks, guidelines and standards. Individual level constraints equivalent to professionalism requires behaviors and attitudes like fairness, common good, honesty, objectivity, dignity, diversity that guide decisions and actions. Adopting responsible management practices and guidelines will optimize digital transformation initiatives and enhance benefits realization and social inclusion.

Figure 2: Digital capabilities framework

Alignment

Alignment capabilities seek the strategic alignment of IT to goals and objectives. The capabilities required are more business and managerial that envision the transformed organization and ensures the investments and interventions follow a results chain aligned with goals and objectives. In addition, effective digital transformation requires visionary and purpose-based leadership that understands the opportunities and risks that comes with a digital journey. Digital-savvy leadership ingrains an organizational-wide culture of innovation in alignment with business and national objectives.

Implementation

Implementation capabilities focus on procurement and the specific delivery of interventions and programmes. Thus, execution capabilities that ensure projects and programmes are delivered within budget and in a timely manner are imperative.

Management

The various components of IT distributed in organizations need efficient management, ensuring availability and security. Digital transformation will require adequate technology infrastructure that comprises efficient networks and data management capabilities to harness the potential of innovative technologies such as cloud computing, artificial intelligence and blockchain for benefits realization. The range of technologies deployed determines the portfolio of technical skillsets required. Extending the enterprise to gig-economy virtual workers or remote workers requires redesigning enterprise architectures to accommodate non-traditional business locations.

Use

Developing end-user capacity and capability to use the digital products and change existing culture and behaviors requires deliberate effort. Hence, adequate digital skills are essential for executing a digital transformation agenda. This requires reskilling and continuous learning to keep pace with evolving technologies to guarantee their long-term digital sustainability.

Enabling Industries

The growth and development of Nigeria and national digital transformation not only requires an enabling and viable technology ecosystem, but also the alignment of digital, economic (private sector) and developmental objectives (at the all levels of government). Thus, economic and developmental objectives should seek to use digital solutions. Likewise, applying a digital mindset should in crafting solutions should address economic and social objectives. Realizing that technology does not drive, but rather enables change, we should deploy digital solutions to change all segments of the economy. This will grow, mature, secure and sustain the technology ecosystem.

Adopting responsible management practices and guidelines will optimize digital transformation initiatives and enhance benefits realization and social inclusion.

Recommendation 14

Public-sector digital competency framework: There is the need to identify and build 4IR competencies and skillsets especially in the public sector agencies adopting innovative technologies. This requires a roadmap for capacity building and reskilling public sector employees and the policymaking echelon in strategic leadership positions. Collaborations with reputable education providers can facilitate the development of a skills and competencies framework, akin to the Skills Framework for the Information Age (SFIA) and aligns with the tenets of the National Civil Service Commission.

Providing Technology in a Safe and Secure Way

Data Protection and Cybersecurity

While cybercrime regulation centers on ensuring that people are safe online, cybersecurity goes beyond averting cybercrime to strengthening government and corporate systems against vulnerability abuse and programme hacking. In Nigeria, despite passing cybercrime bill into law, lacking complementary data protection legislation is inhibitive to information security and data ownership.

The fear of loss of control and independence by current managers of government information assets compounds the data policy environment. Within the purview of digitalization, we build data protection laws and frameworks on general principles, to regulate behavior within a societal context regardless of technology evolution with time.
Critical among these principles for Nigeria is the right to privacy of an individual, fundamental for allowing innovation and creativity. The laws do not have to change regarding AI and other emerging technologies once the fundamental principles are in place unless they are insufficient regarding emerging data protection challenges.

Nigeria's cybersecurity strategy is in alignment with NITDA's cloud computing policy regarding implementing the Nigerian Government Enterprise Architecture (NGEA) at the infrastructure and security layers, which depends on a cloud computing friendly environment. More so, by following the guidelines stipulated in the NGEA, public sector organizations can operationalize technology standards at the infrastructure layer as non-adherence can lead to weak system configurations in the cloud environment, with the negative consequence of circumvention of internal policies that classify sensitive data and protect access to it.

Within the purview of public cloud adoption and the corresponding increase in remote access and open, distributed networks within the digital economy, the panacea to data protection and privacy concerns may not lie solely on data localization, but the development of secure, end-to-end encryption standards for both data at rest and in transit to isolate data (including personal data) from malicious intrusion.

Best Practice: Canadian Government Data Strategy for the Federal Public Service

To ensure that citizens' data was leveraged for digital transformation, Canada's government developed a whole-of-government data strategy to govern the collection, management and sharing of citizen data across all sectors. This strategy focused on implementing privacy-by-design by departments and agencies in the collection and use of citizens' data.

The recommendations of the strategy document focused on four themes: enabling infrastructure ad legislation, stronger data governance, focused treatment of data as a critical national asset, and enhanced data literacy and skills. The data strategy acknowledges the ineffectiveness of a 'one-size-fits-all' approach to data governance. This required crafting data architectures and governance principles that recognized the needs of unique government departments regarding data structures and sensitivities. In harmonizing data security imperatives, the Canadian government developed the National Cyber Security Strategy which details critical provisions for maintaining a ready cybersecurity ready environment capable of responding to emergent risks in cyberspace.

Recommendation 15

Cross-border data flows: The NITDA Cloud Policy advises MDAs to "contract cloud service providers that will store data in a jurisdiction that provides a level of personal data protection equivalent to that provided in Nigeria". As the contracting of CSPs will be from registrations on the digital marketplace, this compliance activity should be part of the CSP certification/licensing process and should not be left to the MDAs alone to guarantee effective compliance, enforcement and monitoring.

Recommendation 16

a) Responsible Cyber-surveillance: The government should protect consumers while attempting to balancing openness and national security.
b) Infrastructure Security: Protecting telecommunications and other digital infrastructure is necessary; hence assenting to the Critical National Infrastructure Bill is essential.

Recommendation 17

Cybersecurity assurance: In 2017, the Office of the National Security Adviser (NSA) released the Draft Action Plan for Implementation of the National Cybersecurity Strategy (NCSS). The assessment of Nigeria's cyber risk exposure, required that the NCSS conduct periodic and continuous national vulnerability assessments to determine weaknesses and vulnerabilities in government information systems, websites, networks, and data handling processes. This serves to assess the country's preparedness against cyber threats and prioritize critical areas for security infrastructure investments. This is currently incomplete and has significant imperatives for cybersecurity assurance in our cloud computing environment.

> Nigeria has a National Cybersecurity Strategy launched since 2014 and domiciled with the Office of the National Security Adviser; we need to execute that strategy'
>
> **Muhammed Rudman, CEO Internet eXchange Point of Nigeria (IXPN)**

Recommendation 18

Institutionalize ngCERT:To articulate an effective computer emergency response capability, a legal framework that defines its functions and responsibilities should empower the Nigerian Computer Emergency Readiness Team (ngCERT). The existing Computer Emergency Readiness and Response Team (CERRT) was setup to support MDAs IT security capacity; considering NITDA's cloud first policy, there is a need for a framework that covers cyber threats for vulnerable sectors such as technology start-ups and MSMEs. The envisaged law should mandate ngCERT to function as the national center for all computer security incident management and stakeholder coordination.

> There is no independent agency either of Government or Non-government responsible for protecting citizens against Cybercrime or even where to report incidence of Cybercrime
>
> **Muhammed Rudman, CEO Internet eXchange Point of Nigeria (IXPN)**

Recommendation 19

Data Protection Law: We recommend the elaboration and passage of a data protection law that fits the Nigerian context and does not just replicate the provisions of other regional frameworks such as the European Union's GDPR. The law should align with cutting-edge technologies while being technology-neutral and should also consider sector-specific requirements in a manner that balances innovation and data protection.

Recommendation 20

Data Protection Commission: Data protection and privacy in a digital transformation era is beyond the domain of the Ministry of Communications and Digital Economy. Nigeria needs a holistic approach. Hence, we recommend a Data Protection Commission – charged with the responsibility of protecting personal data and data subjects and regulating the processing of such data. The commission should also be responsible to ensuring enforcement of compliance procedures by the data protection officers (DPOs) or Data Controllers of data handling organizations.

Conclusion

The digital revolution is providing new pathways for countries to grow and become more productive. However, it is not clear on how we ought to channel this massive potential in maximally impacting the productivity of nations and significantly influencing their earning potential.

In shaping the future of Nigeria as a competitive digital economy within the evolving global knowledge society, we hope these recommendations project Microsoft Nigeria's perspective on critical initiatives for Nigeria's digital transformation.

The fundamental difference between digitally competitive nations has less to do with technology, but more to do with the transformative strategies that complement digital-savvy leadership, digitally skilled citizens and a collaborative digital culture. By immersing these elements within a conducive policy enabling environment, the Nigerian government can create a sustainable technology ecosystem that will drive digital transformation. This process, in line with her Vision 2020 - 'to have a large, strong diversified, sustainable and competitive economy that effectively harnesses the talents and energies of its people and responsibly exploits its natural endowments to guarantee a high standard of living and quality of life to its citizens' - will position her to harness more optimally the opportunities of the 4IR.

This process becomes even more imperative with the recent renaming of Nigeria's Ministry of Communications as the Ministry of Communications and Digital Economy. The new mandate will require an expanded strategy for digital transformation across all the sectors of the economy beyond mere political branding, to position the country to derive her share of the 11.5$ trillion global digital economy. There is a fair amount of work involved, but it is a shared responsibility between governments, private sector enterprises and other interested stakeholders. Adopting the tenets of collaboration, cooperation and co-creation will enhance our leapfrogging abilities.

Endnotes

Digital Transformation: Leading our customers towards a new economy of digital ecosystems.

https://www.eng.it/resources/whitepaper/doc/digital-transformation/engineering-digital-transformation-whitepaper-en.pdf
https://ofs-portal.com/wp-content/uploads/06/2016/Digital-Transformation-Report-Final052118-.pdf

https://hbr.org/04/2017/the-countries-most-and-least-likely-to-be-affected-by-automation
https://www.nigerianstat.gov.ng/elibrary?page=5&offset=40
https://www.vision2021.ae/en/uae-vision

Perspectives on government services, cities and technology.

https://assets.kpmg/content/dam/kpmg/ae/pdf/wgs-kpmg-2019-.pdf
http://dubaidata.ae/
https://www.businessfrance.fr/Media/Default/PROCOM/Articles20%-20%News/20%180523World20%Competitiveness20%Yearbook202018%_ENG.pdf
https://www.huawei.com/minisite/gci/en/country-rankings.html
Gillwald, A., Mothobi, O., & Rademan, B. (2018). The State of ICT in Nigeria 2018. https://www.africaportal.org/publications/state-ict-nigeria2018-/ https://www.undp.org/content/undp/en/home/sustainable-development-goals.html
Internet Governance Forum to intensify efforts towards fostering accessible web for all, Press release, United Nations. https://www.un.org/sustainabledevelopment/blog/12/2016/internet-governance-forum-to-intensify-efforts-toward-fosteringaccessible-web-for-all/
Examples of public goods and services include public education (public schools, colleges, and universities), public infrastructure (airports, electricity, roads, bridges and highways, seaports), mass transit systems, water purification and distribution systems and hospitals.

A Data Strategy Roadmap for the Federal Public Service.

https://www.canada.ca/content/dam/pco-bcp/documents/clk/Data_Strategy_Roadmap_ENG.pdf

National Cyber Security Strategy: Canada›s Vision for Security and Prosperity in the Digital Age.
https://www.publicsafety.gc.ca/cnt/rsrcs/pblctns/ntnl-cbr-scrt-strtg/index-en.aspx\

Action Plan for implementation of the National Cybersecurity Strategy.

https://www.cert.gov.ng/file/docs/draft-action-plan-ncss.pdf