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# The Role of 5G Technology in Transforming Emerging Markets: A Case Study of Nigeria

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## KeyWords

5G Technology, Emerging Markets, Nigeria, Digital Transformation, Telecommunications Economic Growth, Smart Cities

## Abstract

The paper posits to explore the unknown transformative prospects of 5G technology in emerging markets with specific focus on Nigeria. This article discusses the considerable advancements with 5G and how it can accelerate connectivity, data transfer rates as well advancement of IoT (Internet of Things), edge computing or hosting platforms used to process decentralized business logic by using blockchain technology. The study cites how all industry verticals, from education to healthcare and fintech to manufacturing. It also discusses economic growth scenarios, social benefits and 5G in the smart cities. The study highlights the difficulties and potential of 5G adoption in Nigeria, showing insights into their current telecommunications infrastructure as well future digital transformation.

## 1. Introduction

In essence, ICT in its multiplicity is a catalytic driver of economic growth. The advent of the fifth-generation (5G) technology, which is the latest and most advanced technology of wireless communications, is of immense significance. Emerging technologies continue to make vast improvements to humanity and this was highly experienced during the COVID-19 pandemic, where work, business deals, meetings, and the like were conducted through digital channels. Hence, it is essential to determine if this technology can transform emerging markets like Nigeria. A number of studies have indicated the role of technological

development being the catalyst for rapid economic growth, while the rest of the society and economy have benefits from technological development.

Technology is a unique and fundamental driver for economic transformation as well as social change. The diffusion of information and communication technology (ICT) has the capacity to further growth in developing countries almost everywhere in the world. There is indeed an incredible amount of literature related to the role of ICT in fostering growth, providing greater business opportunities, and increasing income, productivity, and trade. In fact, access to ICT can help developing countries to overcome infrastructural challenges and technological bottlenecks, especially those closer to the mid- to high end of the global value chain.

## 2. Overview of 5G Technology

The speed of a 5G network is surprising because it is 100 times quicker than a 4G network. It uses frequencies higher than 28 GHz - small wavelengths that don't go flat when even one obstruction comes in the way. As a result, the 5G connection is always on; on top of that, the concerned information moves and connects multiple devices at the same time. In terms of telephone connection, several federal governmental authorities, financial institutions, and vehicle manufacturing companies have opted to adopt the 5G network. As previously stated, the 5G wireless network offers several advantages, including a faster speed limit of 20 Gbps. The lower border, or lowest required download link, is specified to be 100 Mbps. In addition, it offers significantly lower latency of 1ms when compared to previous networks.

Telecommunications are rapidly evolving, and the need for faster and more reliable networks is becoming more apparent. This is why a 5G network was developed to serve as the next generation of the wireless network. 5G owes its name to the fact that fifth generation network technology is being created. All electronic networks must follow certain requirements in order to function properly. 5G inherits all of these requirements from previous ages but adds a few more. This is the most essential of the numerous features of 5G technology.

### 2.1. Key Features and Capabilities

Massive Multiple-Input Multiple-Output, abbreviated as MIMO, is a wireless technology that relies on numerous transmitters and receivers to transfer more data at once. 5G technology helps curb the deficiencies of 4G multiple input multiple output (MIMO), wireless communication systems.

5G supports beamforming antennas, the most significant new feature that enables throughput enhancement that was not available in the 4G network. It can now transmit data to many users at once with similar or same RF resources or in RF dimensions.

In addition to the higher frequencies, the millimeter-wave 5G radio wave spectrum supports the use of ultra-high multi-antennas. Numerology harmonics exist in 5G, in which

sub-carrier spacing has a fundamental value (lowest available value for SCS), then multiples of this level are called their subcarrier spacing numerology. 5G radio will make use of three different numerologies to differentiate and hence support a wide range of data rates and bandwidths.

Numerology in 5G enforces frequency-time grid patterns, numbering systems, and indices, which serve as the framework for the transmission of uplink and downlink data over the air with associated transmission numerology specifications, like symbol duration, slot duration, and sub-slot duration.

5G, being the latest development in mobile technology, possesses a lot of great features and capabilities. These, for some period, existed as the benefits and implications of 5G technology for emerging economies, for any nation desirous of economic growth. Some of the key features and capabilities of 5G technology are Numerology, Advanced Beamforming and MIMO, Dual Connectivity, and massive MTC, among others.

## 2.2. Potential Applications in Emerging Markets

Potential applications in emerging markets: The trends in emerging markets are coverage expansion and ultra-low latency. Through this, telecommunications penetration can be increased and remote areas that are currently underserved in countries such as Nigeria can have access to such services. A study on the socio-economic dimension of 5G for Nigeria is not currently available. However, a number of educational applications in Nigeria have been noted, including the setting up of a digital system of payment for young women in Kaduna for their secondary education girls' grant. Drones with thermal imagery are also being used to speed up soil testing by researchers at the International Fertilizer Development Centre, analyzing data which allows local farmers to get real-time soil research results within 15 minutes to 48 hours instead of waiting months. It also allows subsistence farmers in the villages to get immediate soil testing. RAILHOPE Ltd has introduced a number of learning packages using 5G connectivity.

There are numerous potential use cases for 5G technology in emerging markets, particularly the countries in Africa where internet penetration is still low. The government and the private sector have launched different initiatives to facilitate and enhance the connectivity of the unconnected, mostly in rural Africa. Everyone is eyeing digitalization of the region, transforming the countries into smart and intelligent nations. This section identifies potential applications of 5G.

## 3. Emerging Markets and Digital Transformation

This provides important context necessary to untangle the robust relationship between economic performance, digital readiness, and market transformation in emerging markets. It sheds a rather pessimistic tone, expressing that most of the countries appear to exhibit a state of inertia by only being capable of adopting technological advancements rather than spearheading them. From this view, it is merely a matter of playing catch-up with the

economies of the core, given the political control surrounding development and the continued existence and importance of extractive economies. Often, the costs of techno-economic transformation are taken as far too high. Offshoring of sophisticated manufacturing and service work is often viewed intermittently, and therefore the established global value chain (GVC) configurations are seen as too complex to reform.

Emerging markets and digital transformation: In the digital global economy, emerging markets are seen largely as part of an incomplete and underperforming digital transformation process. Weak transformation in some emerging markets has been brought about by several constraints, such as difficult fiscal policy choices and high levels of politicization in driving development. This is opposed to a pragmatic and evidence-based rationale that often characterizes advanced digital economies. However, rather than being a basket case of constraints, some argue that emerging markets have unique capabilities that can be leveraged for a bold path-break with digital technologies. This is based on better micro-foundations theories supported by evidence-based research. The countries also have the advantage of relative youthfulness in majorities, which can be seen as constituting a demographic "digital dividend" that is suitable for indigenous digital innovation. Emerging digital technologies like 5G in Nigeria could be key in making this aspiration a reality.

### 3.1. Challenges and Opportunities

Digital transformation in emerging markets provides new possibilities for integrating the rural population into national and international markets. Such integration offers clear benefits for rural communities in terms of market access and economic growth. The potential that information and communication technologies can support people's livelihoods has long been recognized, and for more than a decade, deploying these technologies to achieve pro-poor outcomes has been a focus of international development agencies. Here, we present the general factors that have led to the design, development, and formalization of a number of living lab experiments that have taken place in emerging markets, with particular reference to Nigeria. We believe the trends in Nigeria reflect general patterns that are emerging across the developing world.

An analysis of the contributions of 5G technology to digital transformation is incomplete without a discussion of the drivers of digital transformation. By outlining the specific challenges and opportunities that arise in the process of digital transformation in emerging markets, this chapter has explored the factors that underscore the increasing relevance of 5G technology in countries like Nigeria. Section 3.1 outlines the challenges and opportunities associated with digital transformation in emerging markets. Special emphasis is placed on Nigeria as a case study, as the country's efforts to implement e-services in sectors like banking, transportation, and academic management provide an illustration of general trends in the development of emerging markets. The section concludes with the assertion that the uptake of 5G technology in Nigeria has the potential

to automate processes across various sectors and attract international business into the country.

## 4. Case Study: Nigeria

Value Propositions in the Nigerian Context: - Accelerating the Progress of Economic Growth - Boosting other economic sectors - Education and Healthcare - Productivity and efficiency - Innovative and new ways of doing things including manufacturing - Entertainment, Media, and communications - Enhancing public safety and national security - Efficient management and control of city infrastructure - Reduced traffic jams - Smart city applications

Context: In Nigeria, the current fixed-line infrastructure is very weak, with no nationwide available ducts, manholes, or poles. Though Nigeria has communicated that the fixed-line infrastructure has been in deployment for over ten (10) years and is 65% complete, the government is currently driving a national fiber backbone deployment known as the National Broadband Plan (2013-2018): "Nigeria's Broadband Plan for Overall Economic Growth." It is anticipated that the plan will run in 5 phases to include ADVANCE, INTEGRATE, SUSTAIN, TRANSFORM, AND OPTIMISM. There are, however, still wired infrastructure in city centers and buildings, especially those associated with ministries and some private establishments. The market's retail sector is dominated by mobile wireless technologies (2G, 3G, and 4G). Because of the apparent limitations of the wired infrastructure, not much active fixed-line services (broadband/IPTV, VoLTE) are moved to that in the cities. In view of this, it can be said Nigeria is currently being driven by, and has converged to mobile telecommunication services, which include voice and data.

Nigeria...

The push towards developing digital infrastructure cannot be complete without putting emerging markets into consideration. This section dives into a country case study to highlight the specific factors affecting the evolution of 5G technology within Nigeria.

### 4.1. Current Telecommunication Infrastructure

The contribution of the sector to the national economy is colossal. According to a report in 2017 by the Nigerian Communications Commission (NCC), "the telecoms sector in the first quarter contributed a total of N1.5 trillion to the GDP, compared to N1.4 trillion in the first quarter of 2016, and N1.43 trillion in the last quarter of 2016. The National Bureau of Statistics further noted that "it contributed 9.1 per cent to Nigeria's gross domestic product in 2016." Given the profitability of the industry at the base, efficiency in the use of resources, and economies of scale, the biggest attraction for MNO making the investment in 5G is that it will also represent efficiency from an input perspective. Given the advanced economies of scale and efficiency, the societal demand for 5G, including Nigeria, is - from an economic perspective, quite understandably about sustainable lower prices - due to infrastructures of facilities, automation, and digitization.

In terms of existing telecommunication infrastructure, Nigeria is considered to have a competitive telecommunication sector, especially considering some of the weaknesses in the ICT ecosystem of the economy. Compared with other countries in the region, the telecommunication sector in Nigeria has experienced transformational changes since the turn of the 21st century. It is home to one of the largest mobile markets in Africa, supported by a population of around 200 million. The strong market position of Nigeria is due to its dominant mobile sector. The fixed-line sector in Nigeria remains underdeveloped. The CBN Annual Report (2018) opined that the liberalization of the sector in 1992 has resulted in the positive transformation of the telecommunication sector, which has brought with it more than \$68 billion in Foreign Direct Investment.

## 4.2. Adoption and Implementation of 5G Technology

**Adoption and Implementation of 5G Technology:** This section centers around the adoption and implementation of the 5G technology in Nigeria. It comprises the following subthemes: strategies for 5G adoption; challenges of 5G technology implementation; and opportunities of 5G technology in Nigeria. **Strategies for 5G Adoption:** The induction and implementation of the 5G technology follow a time realism plan. Nigeria, as one of many who gaze at the technology, forms a critical alliance within a coalition fronted for by the International Telecommunication Union. The strategy looks at how least advanced countries could either deploy the custodians of the technology or use the ecosystem of partners to provide better 5G access.

In Nigeria, the much-anticipated 5G technology is regarded as the next big thing for the telecommunication industry. Issues relating to adoption of this technology have been discussed at various fora and good solutions developed and circulated. According to the Nigerian Communications Commission (NCC), the frequency for 5G technology has been earmarked and returned by the Ministry of Aviation, which hitherto occupied the frequency area. Also, the Nigerian Communications that will pilot the deployment of the technology in major urban areas of the country. So, if all the infrastructure needed has been provided, the biggest question that comes to mind is: when will Nigeria go on 5G? Therefore, this paper endeavors to explore the views of stakeholders on the critical issues of 5G technology in the country. After an extensive discussion, we present these findings to the international community in order to help proffer solutions to Nigeria and other countries in similar situations.

## 5. Impact of 5G Technology in Nigeria

The rollout of 5G in Nigeria has the potential to accelerate this positive impact. With a population that may reach 450 million by 2050, Nigeria's ability to leverage 5G technologies has implications for Africa and the rest of the world. 5G technology has the potential to make a significant difference in Nigeria. Bridging the digital divide, 5G technology puts users "in near touch" with "other people's experiences and problems". To test these claims, we investigate the impact of 5G technology in Nigeria on economic growth and innovation, and social inclusion.

First, 5G is seen as an enabler of economic growth for Nigeria as a whole. 5G, according to its enthusiasts, could lead to significant improvements in innovation, health, and the digital economy. In addition, 5G technology could potentially lower the divide in Nigeria between urban and rural areas, as well as South and North. Indeed, there are already human rights concerns about existing 4G technology. However, the project outcomes should demonstrate transformative possibilities while also indicating that access to 5G technologies is unlikely to resolve the broader challenges for the targeted communities and the country as a whole.

Nigeria is a significant emerging economy with diverse needs and varied services. It is the most populous country in Africa and the sub-Saharan. It is in acute need of basic necessities such as medical care, drinking water, food, and shelter. The diverse country has manifold income levels, with some people in the country living in a state of absolute poverty. Thus, it appears that 5G technology could potentially transform Nigeria.

### 5.1. Economic Growth and Innovation

5G is expected to solve the current infrastructural and structural equation in Nigeria by fostering the digital industry as well as enabling economic growth. Overall, 5G can contribute towards economic growth in at least two specific ways: via an increase in the production and productivity of multiple sectors, and via an increase in technological spillover or knowledge creation. Moreover, the prevailing anti-innovation policy approach of the government has slowed the dynamics of innovation. Herrnstadt, Primi, & Sweet (2019) show that restrictions on foreign investment in telecommunication infrastructure as well as digital services are firmly tied to less innovation in terms of network performance and, more deleteriously, in data-driven industries, where innovative firms may be deprioritized in favor of larger incumbents. This essentially tips the balance in favor of the incumbents, stymies innovation and rewards inefficiency. Moreover, the current regulatory bottlenecks have failed to facilitate the direct, spillover, cumulative, and network effects of the knowledge economy.

5G offers immense potential to contribute towards economic growth and innovation, which are pertinent factors as far as the demand-side benefits (willingness to pay) for the technology investment are concerned. Djankov and Saliola (2018) revealed in their multi-country study that the adoption of new digital technologies had the most significant impact on economic growth by aiding and raising the productivity within a country. Boonpongsa and Sunte (2017) also showed that a 1% increase in wireless broadband users expands the GDP of a country with 0.95%, henceforth intensifying competition in the telecommunications industry, which leads to new strategic alliances in changing market dynamics. To break this down further, 5G deployment will likely boost economic growth through various mechanisms, including an increase in cross-sectoral production possibilities, enhanced industrial competitiveness, and a greater impetus in consumer demand.

## 5.2. Social Inclusion and Access to Services

The underlying assumption is that connectivity – or the ability to get mobile broadband – is a necessary first condition for all of these discussions. Thus, the focus will not so much be on the access to 'an' internet connection – typically the question as posed by many market and applied researchers – but rather access to good quality data at fast speeds, understanding that modern technology increasingly requires a stable, low-latency internet connection. Further, corporate demand is revving up. The same PwC report highlighted, turns Goldman Sachs have forecast that industries and companies could spend between \$1.4 trillion and \$3.6 trillion on 'internet of things' hardware over the next few years. More demanding and difficult verticals, such as healthcare, are predicted to rise the most. This will likely be on top of using connectivity to become mobile.

This chapter is dedicated to an assessment of the potential impact of the rollout of 5G technology for future economic development in Nigeria. The discussion is structured according to various categories of social, political, economic, and environmental impact. The aim is to indulge in some informed conjecture and contribute to the discussion around evidence-based policy-making in order to best align the latest insights from the techno-economic ecosystem with the ultimate desire to use technology to transform emerging markets and affect a structural redesign of how business and government operate. It does this by zooming in on the case of Nigeria and its particular reality, focusing on: 1) demographics and urbanization, as contributors and victims of societal ills; 2) education and healthcare, as potential segments made more efficient by mobility; 3) financial inclusion and poverty alleviation, in the light of economist Joseph Stiglitz's idea of giving everyone a mobile wallet; and 4) environmental friendliness, and how 5G technology can be harnessed to increase it.

## 6. Conclusion

As more innovative use cases emerge and costs decrease with the growth in the global 5G subscriber base, 5G will continue to take root and expand both in Nigeria and its larger emerging markets. Nigeria, like the rest of the world, needs to continually review its regulatory, policy, and indeed industrial landscape to provide more opportunities for easier, cheaper, and safer communications, as well as extend the socioeconomic benefits in various ways to its population. This needs to occur to support the constantly evolving telco landscape of Nigeria and to attract a wide array of network, digital services, and application providers and foreign investors into its massive telecom/ICT market of nearly 200 million users. Given our world economy, intelligence, finance, and diplomacy trajectory, this will enable Nigeria to participate in global tech leadership and co-op network interoperability in order to thrive further and reinforce its commitment to universal service and access to global technology in 2030.

5G has the potential of not only transforming the Nigerian economy but also that of emerging markets, in general, by bringing about such innovations as smart cities, connected industries, and network slicing. By increasing data transfer speeds and reducing



latency, 5G not only sets the stage for these innovations that will be fueled by artificial intelligence, machine learning, cloud computing but also makes them feasible. It should be recalled that technological change as represented by the different generations of wireless technologies has had a central and characterized role in Nigeria's numerous revolutionary transformations, be it in financial inclusion, business, education, or healthcare. Given Nigeria's status as a leader in and pivotal player of sub-Saharan Africa, this transformative effect of 5G in emerging markets is exactly what 5G will also herald elsewhere within the region and by extension in other similar economies.

#### References:

Tamarapreye, O. A. (2021). Overview of Nigerian Telecommunication Industry. IRLJ. [nigerianjournalsonline.com](http://nigerianjournalsonline.com)

Madaki, A. M., Habibu, M., & Musa, H. M. (2021). ... of Nigerian Communication Satellite (NigComSat-1R) Services for Internet Access among Agencies of Federal Ministry of Communications and Digital Economy in .... [futminna.edu.ng](http://futminna.edu.ng)

Mohammed, M. A., Mohammed, H., & Hayatu, M. M. (2021). Utilization of Nigerian Communications Satellite (NigComSat-1R) Services for Internet Access among Agencies of Federal Ministry of Communications and Digital Economy in Nigeria. NASARAWA JOURNAL OF LIBRARY AND INFORMATION SCIENCE (NAJLIS), 5(1), 13-23. [najlisnsuk.ng](http://najlisnsuk.ng)

Yeboua, K., Cilliers, J., & le Roux, A. (). Nigeria in 2050. [issafrica.s3.amazonaws.com](http://issafrica.s3.amazonaws.com). [amazonaws.com](http://amazonaws.com)

Balogun, N. A., Ehikhamenor, F. A., Mejabi, O. V., Oyekunle, R. A., Bello, O. W., & Afolayan, O. T. (2020). Exploring information and communication technology among rural dwellers in sub-Saharan African communities. African Journal of Science, Technology, Innovation and Development, 12(5), 533-545. [\[HTML\]](#)

Okolie, U. C. & Ojomo, A. H. (2020). E-COMMERCE IN NIGERIA: BENEFITS AND CHALLENGES.. Humanities & Social Sciences Latvia. [lu.lv](http://lu.lv)

QUADRI, D. A. (). Human Resources Management Practices and Employee's Productivity of Globacom and MTN Telecommunication Company in Ibadan, Oyo State, Nigeria. [nioaim.org](http://nioaim.org). [nioaim.org](http://nioaim.org)

Oluwasemilore, I. A. O. (2023). CHALLENGES OF NIGERIA'S DIGITAL ECONOMY: WAY FORWARD. UCC Law Journal. [ucc.edu.gh](http://ucc.edu.gh)

Omisakin, O., Erumebor, W., Iyoha, F., Adekunle, W., Olofin, S., Taiwo, S., ... & Oluwaserantimi, O. (2021). Review of the Nigerian Economy in 2020 and Key Priorities for 2021 and Beyond. Economic and Policy Review, 19(1). [ajol.info](http://ajol.info)

Azolibe, C. B. & Okonkwo, J. J. (2020). Infrastructure development and industrial sector productivity in Sub-Saharan Africa. Journal of Economics and Development. [emerald.com](http://emerald.com)