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**OVERCOMING BARRIERS IN
TECHNOLOGY-DRIVEN HEALTHCARE
ENTREPRENEURSHIP IN LOW- AND
MEDIUM-INCOME COUNTRIES (LMICs): A
LOOK AT THE BARRIERS**
**(A Country Case Study Report Towards Successful
Digital Healthcare Entrepreneurship Creation in
Nigeria)**

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Executive Summary

As with other major sectors, innovation has become the new panacea for addressing the numerous healthcare delivery issues. In this report, the healthcare sector of emerging countries of Nigeria as a case study was examined from the context of technology entrepreneurship and innovation intelligence. Innovation intelligence and technology intelligence are believed to be one of the answers to the numerous problems faced in the healthcare space. This report looks at the barriers facing the successful creation and operation of technology-driven healthcare entrepreneurship in Nigeria. In order to do justice to this, this report is neither solely from extant literature neither is it only from practical experience and/ or investigation but a combination of both to provide a report which would add to research body of knowledge as well as the practical healthcare dissemination and rigour.

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1.0 Report Introduction

Over the course of this present economic globalization, innovation and entrepreneurship have gained enormous importance in all sectors of business endeavours like in healthcare delivery. The emergence of entrepreneurial economy stimulated a new type of competition which is further exacerbated by the eroding global sovereignty. Nowadays, competition is not just limited to a local area or country, technologically-induced globalization which made the world but a small village has made sure it is rife with international standards and best practices. The practical implication is that a hitherto confined health practices in a village like Fiditi, one of the most remote villages in Nigeria for instance, can now be compared with that of Norway which has one of the best healthcare deliveries in the world. This signals a growing health need based on international benchmarks and global practices.

Despite this growing need in healthcare dissemination, its delivery in low- and medium-income countries (LMICs) have continued to be hindered by a lot of things like dysfunctional healthcare systems that failed to deliver quality, affordable and available healthcare to the citizens (Ahlan & Ahmad, 2014; Blaya, et al., 2010; Furusa & Coleman, 2018; Ajzen, 1991; Gücina & Berka, 2015; Zayyad & Toycan, 2018); increasing healthcare cost owing to the need for precision medicine and the growing drug-immune diseases (Abdekhoda et al., 2015; Hossain et al., 2019); economic crises which made LMICs not to be able to spend the World Health Organisation (WHO)-required budgetary threshold on healthcare; high level of medical error (Hossain, et al., 2019); global healthcare staff shortage which is worse in LMICs (Bleich & Slack, 2010); ageing population (Yaya et al., 2017) and other important demographic changes among others. One of the ways of surmounting these challenges is by leveraging the use of information and communication technology through intelligence innovation and entrepreneurship (Abdekhoda et al., 2015; Bleich & Slack, 2010).

Throughout the rich history of healthcare dissemination which is as old as human race itself, several innovative processes have continued to give us inventions that have changed the face of healthcare. Thanks to good functionalities and their abilities to creating the needed value, their importance to future development can not be overemphasized. Despite the perceived opportunities presented by technology entrepreneurship to the development of the industry and the overall economic growth, potential entrepreneurs seem to face a lot of barriers particularly in LMICs like Nigeria. Safe to say this is however a global phenomenon that is just worse in LMICs. Colin & Zins (2015), for instance, argued that despite the market size and the insatiable hunger for innovation by patients and healthcare workers alike as well as digital health being in the early stage of digital transformation, entrepreneurship in healthcare is difficult than most other industries and sectors. The report, by

Colin & Zins (2015), asked that lingering question: Why is it so hard to found a successful start-up in healthcare sector? While this report is to provide answer to a seemingly similar lingering question, it even adds dynamicity to it by adding the LMICs perspectives and particularly, the Nigeria unique situation considering it is in more dire needs. This would be better explained in the next section.

2.0 The Case for Technology Entrepreneurship in Nigeria's Healthcare Space

Besides slight differences, entrepreneurship is almost similar in all industries. In healthcare industry, the difference is in the lives of people at stake which make the need to seek for (technological) innovation a risk-averse one. A simple mistake in an entrepreneurial product or service in this industry can lead to deaths of hundreds and thousands of people. Perhaps this typifies why the diffusion of technology entrepreneurship is still low behind other industries like finance, hospitality, logistics, and commerce among others. The rationale behind this underpins this report and is more detailed in the next section; barriers towards technology entrepreneurship. A prior lingering question would however be why Nigeria need technology entrepreneurship?

As with all climes, technological advancement has been used to solving many societal needs and problems. Over the course of the decade, there is massive increment in the use and adoption of internet and mobile telephony in Nigeria and Africa at large. This has resulted in the adoption of electronic market in many industries as well as the proliferation of services like e-banking, e-commerce, e-learning and e-health (digital health). The need for digital health, and by extension, digital health, has been particularly and continuously echoed by United Nation's World Health Organization which keeps tab on health indices, set health benchmarks and make appropriate recommendation as per their mandate. One of such recommendations is the doctor to patient ratio.

In Nigeria, as with most part of LMICs, the doctor to patient ratio is ridiculously low. According to Owoseye (2019), quoting a figure he got from the Medical and Dental Council of Nigeria (MDCN), the body responsible for overseeing medical and dental practice in the country, the country has 39,912 practicing medical doctors. With the present population of Nigeria put at 201,856,954, according to a live data from Worldometers (2019), the doctor to patient ratio stands at 1:5057. To put in proper perspectives, United Kingdom has 1 doctor to cater for 357 people (1:357), Greece has one doctor to 167 and the average for EU is one doctor to 256 people (Wickware, 2018). As bad as this statistic is, professional assessment even points to the fact that this sad trend would continue in the

foreseeable future. One of the main reasons is the medical brain drain which has heralded the country and can be associated with both push and pull factors.

In this context, push factors are those factors that collectively drove away the medical personnel and lead to medical brain drain in most LMICs. In Nigeria, this include the poor remuneration, limited training, rapid population growth, lack of career progression as well as inequality in the distribution of medical practitioners to hospitals and health clinics among others. According to a report by Ighobor (2017) of the United Nation while diagnosing Africa's medical brain drain, "On average, surgeons in New Jersey earn \$216,000 annually, while their counterparts in Zambia make \$24,000. Kenyan doctors earn on average \$6,000 per annum". It is not surprising if someone earning \$6,000 per annum write a single exam and started making \$216,000 while attending to lesser people. While the salary amount in saner climes is a classical example of pull factor, there are many push factors greatly driving the doctors out of LMICs as stated earlier. Perhaps the one which provided a foundational basis for all other factors is the budgetary provision for healthcare in LMICs: while the budgetary allocation per person for an annum for Norway and UK are \$6000 and \$4000 respectively, that of Nigeria is \$6 (Punch News, 2018). This low budgetary allocation leads to poor condition of service for medical practitioners and as such poor health care provision. At the same time doctors and other healthcare practitioners are been pushed out of the country, the likes of United Kingdom, United States of America, Canada and Australia among others are pulling them so strongly to their side. With better career progression, high salary and other good conditions of service, it's not surprising to see doctors leave LMICs.

Besides this brain drain in the medical profession which is well documented, Nigeria's rapidly growing population would further put more stress on the already stretched health provision. If 39,912 health practitioners are taking care of 201,856,954 and the health provision is ranked one of the world's worsts, what would it be like when the country becomes the third most populated country in the world eclipsing that of United States of America by 2050, less than 30 years' time, but with a fraction of their medical personnel? The sad reality is lots needed to be done and one of such measures to see to the improvement of healthcare delivery is in leveraging information and communication technology via technology-driven entrepreneurship.

Extant literatures are particularly laced with how various technologies can be (or have been) used in solving the ever-increasing global health needs (Engelhardt, 2017; Ilorah, et al., 2017; Ovretveit, et al., 2017; Williamson, 2016). This includes the likes of cloud computing (Hanen, et al., 2016; Navale & Bourne, 2018), big data and artificial intelligence (Abouelmehdi, et al., 2018; Olshannikova, et al., 2015), blockchain (Engelhardt, 2017) and a host of others (Peter & Victor, 2009). The application of

Artificial Intelligence (AI) technology to health care provision has particularly generated buzz in recent times owing to its wide applicability to healthcare. Examples of this includes Mesko's (2017) work on how AI could help in general precision medicine, Reddy et al.'s (2018) work on application of AI in healthcare delivery, Krittanawong et al.'s (2017) work on how AI could help achieve precision cardiovascular medicine, Gill-Cox's (2018) use of AI for clinical medicine, and Ringold's (2015) use of AI for better cardiopulmonary resuscitation (CPR) among others. Just as these research work placed emphases on the high income countries like the United States and United Kingdom, the practical application in businesses via various entrepreneurship and intrapreneurship programs in enterprises similarly mimics this trend. The likes of Babylon, Elder, Open Bionics, Benevolent AI, Forward Health and lots more in the United Kingdom typifies this.

Summarily, with the rapidly increasing population growth in Nigeria and its unique need for healthcare provision, it's high time these technologies are used in making new ventures as were in high income countries. To do this however, several barriers occur.

3.0 Barriers to Technology-Driven Healthcare Entrepreneurship

The barriers to technology-driven healthcare entrepreneurship can arise from different venues; from problems associated with innovation in healthcare which is pivotal to successful entrepreneurship to those barriers in entry as well as organizational structure among others. One of the tacit classifications of the barriers of in entrepreneurship is that of Rivera-Santos, et al.'s (2015) investigation in sub-Saharan Africa. While the work is mainly on sub-Saharan Africa countries, it is applicable to this situation as virtually all sub-Saharan Africa countries are LMICs and Nigeria belong to both too. More so, that the used examples shared similar health and economic indices provide the needed justification for its use. In Rivera-Santos, et al.'s (2015) work, they posited that the barriers that often persist are mainly four thus: lack of financial capital, low levels of demand for new products and services, inefficient administrative systems, and underdeveloped physical infrastructures. They further posited that these four explains why entrepreneurship businesses are more difficult to run in sub Saharan Africas (SSAs) than other parts of the world.

While writing on the challenges of technology entrepreneurship in emerging markets which is applicable to this contexts too, de la Chaux & Okune (2017 citing Pissarides et al., 2003) was very bullish in their assessment of the lack of financial capital for entrepreneurs: they posited that the associated economies often "exhibit rudimentary and sometimes barely functioning financial markets" which is an established precursor to depreciation and high inflation rates in the associated markets. This make securing capital for venture creation, entrepreneurship, difficult, de la Chaux &

Okune (2017) concluded. In a prior research, Julian & Ofori-Dankwa (2013) also highlighted problem in securing funding as one of the main problems associated with technology entrepreneurship. While citing the interest rate of 9% in Kenya, Julian & Ofori-Dankwa (2013) is not that bullish in their assessment of the financial markets of the countries but however enumerated the difficulty in securing funds and highlighted its impact on technology entrepreneurship. Funding as a major problem to successful entrepreneurship is supported by many a researcher and well documented in extant literature (Garbuio, et al., 2018; Gigauri, 2018; Hervieux & Voltan, 2018; Kanze, et al., 2018; Rodchenko & Prus, 2017). While these nuances from extant literature are from different contexts: countries – Georgia (Gigauri, 2018), Ukraine (Rodchenko & Prus, 2017), SSAs (Rivera-Santos, et al., 2015), Nigeria (Adebayo & Ofoegbu, 2014) and others (Hervieux & Voltan, 2018; de la Chaux & Okune, 2017); entrepreneurship type – social entrepreneurship (Gigauri, 2018; Rivera-Santos, et al., 2015; Rodchenko & Prus, 2017) and digital entrepreneurship (Blaya, et al., 2010; Colin & Zins, 2015; Garbuio, et al., 2018) among others; there is however a unifying factor on the importance of funding to entrepreneurship across all divides. In digital health, particularly and even at the global market, the amount of funding secured can not be compared with other industries. Until 2018, CB Insight reports as well as those of McKinsey and PwC have particularly showed Fintech (financial technology) leading the funding rounds. It is perhaps one of the reasons Colin & Zins (2015) argued that entrepreneurship is harder in digital health. From practical experience and reviewing the fundings (at both seed and venture capitalism stages) of technology entrepreneurship in Nigeria, it is easy to see why digital health entrepreneurship is even harder in Nigeria. For instance, no Nigeria healthcare funding has raised upto \$1 million funding in healthcare while in e-commerce, edutech, fintech, and logistics, hundreds of millions of US dollars have been raised many times. Techpoint Africa report annual funding reports gave credence to this. With the difficulty in seeking funds well established, entrepreneurs often bootstrap their startups with personal savings or borrowing from friends, Thornton, et al (2011) posited. This is an existential problem.

The low levels of demand for new products and services by emerging countries, and by extension LMICs, as posited by Rivera-Santos, et al. (2015) is very nuanced in the associated causes but a common-sense in its effects. It's only sane that people with prevalence of subsistent income, as was associated with the population under review, would generally be cautious of what they use the income for. Reuters' (2014) report as well as Orser et al. (2000 cited in Rivera-Santos, et al., 2015) also buttressed this by positing that potential customers who have prevailing subsistent income are less likely to risk spending the small amounts of available cash on new products and/ or services which have not been confirmed by widespread adoption. Reuters (2014) illustrated this with the mobile phone market in Kenya and argued that while penetration for the market is huge, Kenya

customers were still hesitant to buying products and/ or services that were locally made and instead go for global technology companies such as IBM, Samsung and Huawei among others.

By the same token, Peci, et al. (2012) also opined that the legal and administrative systems in most LMICs which were often marked by old systems, delayed procedures, corruption and lack of enforcements of property rights is an important barrier to creating and operating new ventures. This is also supported by Aidis et al. (2012) who opined that the highlighted anomalies in the legal and administrative systems in emerging and LMICs make creating and operating these new ventures time-consuming and costly. Particularly in Nigeria, this is quite understandable and sadly affects to a great extent. According to the World Bank annual ratings of ease of doing business among 190 member nations, Nigeria ranked a worrisome 146 in 2018, a rank worse than the 145 it was in 2017. The ten (10) sub-indices that the ease of doing business were based; starting a business (the time, cost and procedures among others), protecting investors (extent of director liability, ease of shareholder suits and indices on the extent of disclosure), dealing with construction permits (the time, cost and procedures among others), paying taxes (the hours per year spent on preparing taxes, number of taxes paid and the total amount of tax paid as share of the business gross profit), getting electricity (the time, cost and procedures to getting permanent electricity connection among others), registering property (the time, cost and procedures to registering commercial real estate among others), enforcing contracts (the time, cost and procedures to enforce debt contract among others), resolving insolvency (the time, cost, procedures and recovery rate under bankruptcy among others), trading across borders (cost, number of documents needed, procedures and the time for exporting and importing goods among others), getting credit (depth of credit information index, strength of legal right index, time and procedure of getting credit among others); have all shown to affect new venture creation and operation to large extent. More so, besides the fact that the establishment of the ease of doing business report is rooted in research, the research paradigm itself has served as the basis upon which thousands of academic and business research works have been premised. Of course, application of this in totality and wholesomely is more nuanced as there are important caveats and void upon which this World Bank backed research has left. Nevertheless this including not inculcating all business environmental factors like the macroeconomic conditions of the country of existence as well as not including all the regulatory requirements of the country the businesses are set, the ranking underscores the importance of (administrative and legal) environment to technology entrepreneurship success.

In addition to those ones, the importance of adequate infrastructure cannot be overemphasized in the creation and operation of new venture creation too. This importance underpins the fourth major

reason highlighted by Rivera-Santos, et al. (2015) as the barriers to entrepreneurship in their study. Coad & Tamvada (2012) while supporting this stance argued that the inadequate infrastructure in the emerging countries impede access to suppliers, market information and consumer markets which make them incur additional costs in order to reach their suppliers as well as customers. Thornton, et al. (2011) also opined that in this regard, those entrepreneurs as well as other business owners often rely on personal networks like family and friends in accessing market information and to reach suppliers.

A more encompassing and a broader classification of these barriers without listing the individual factors would be the categorization under economic, organizational and behavioural barriers to technology entrepreneurship as it pertains to healthcare. While the sub-factors under these classifications are enmeshed with the four main barriers to technology entrepreneurship of Rivera-Santos, et al. (2015), they are broad classifications and not just the list of the main important barriers. Structural and economic barriers, for instance, inculcate all those problems associated with the structure of the healthcare system, economic systems and the interlinking intricacies. While the global healthcare enjoyed certain level of successes, the associated complexities in the set-up is such that it greatly affects entrepreneurial activities. More so, Commonwealth Fund (2003 cited in Rivera-Santos, et al., 2015) posited, that the mission of most hospitals especially academic and research medical centres are mostly rooted in service and/ or education and they set the tone for such to be accepted as “price of admission”. Such mission is often set externally by societal and governmental consensus and regulation in such a way that activities believed to be deviating from this externally-set consensus is often met with receptive audiences. This is often true in the Nigeria case where some people often see hospitals as well as healthcare innovations as charities without the notion to make money. Like Peter Thiel repeatedly emphasized in his book, Zero to One, there is no need to look at things from a sorry state of either Yin or Yang; that is, in this case, either you want to make money from your healthcare invention and entrepreneurship, or you want to serve the community you belong. He emphasized looking at things from Yin and Yang by emphasizing that both can be done simultaneously without necessarily affecting one. Many books on Entrepreneurship like “Good to Great” by Jim Collins also emphasized the same and cited many vivid examples.

Besides this institutional belief which is damaging to technology entrepreneurship in healthcare, there is also a complex web of regulatory requirement which is often difficult, time consuming and costly to navigate especially in LMICs where bureaucratic norm is entrenched than the survival of any entrepreneurial venture. Simply put, the structures of the several healthcare systems like

Nigeria often conflict with the conditions that are necessary for the maximum growth and development of entrepreneurial business in digital health.

Summarily on the structural barriers to technology entrepreneurship in healthcare, digital health is more probable to flourish in an environment that celebrates individual or collective brilliance in solving a societal problem instead of larger societal missions; where there is financial rewards in tandem with solving a societal problem (a classic case of the Chinese Yin and Yang; YinYang) rather than providing services alone without the associated financial benefit (Yin or Yang); where emphasis is placed on the need for digital health solutions and its effect on the country's populace instead on focusing on corruption-induced and ever-static bureaucratic norm; as well as one which allows for strong competitive pressures for digital health entrepreneurs to succeed and succeed fast in the place of just having a health institute tagged with doing something about healthcare for the sake of just doing something.

Concurrent with the structural barrier is the economic barrier affecting digital health entrepreneurship. The importance of the economic status to this cannot be overemphasized. The economic activities of a country determine the Gross Domestic Product (GDP) of such country and the amount spent on public healthcare. To put in proper context, high income countries like the United Kingdom spend high percentages of their GDP on healthcare while LMICs like Nigeria spend lesser percentages on healthcare. According to the data from World Bank, for instance, as depicted in the figure below, the United Kingdom health expenditure for 2016 is 9.762% of her GDP while that of Nigeria is 3.647% in the same fiscal year (World Bank, 2019). When the actual value of the GDP is factored in, the context even become clearer. For instance, with the GDP of UK, according to data from the Office of National Statistics and the World Bank (ONS and WB references) at 2.651 trillion USD giving a GDP per capital of \$40,658 (Country Economy, 2016a) while that of Nigeria at same year is 404.7 billion USD giving a GDP per capital of \$2180 (Country Economy, 2016b). The practical implications of this is in many folds but two important ones are that; high-income countries like the United Kingdom have more money to spend for healthcare both in public health and in support of technology entrepreneurship just like the LMICs would not have much in supporting digital health entrepreneurial start-ups. And, perhaps more importantly, more money in the pockets of the citizens means people would be able to afford digital healthcare products. While this is commonsensical, many research works like Reuters (2014) and Rivera-Santos, et al. (2015) also supported this stance as stated earlier in this report that prevailing subsistence income make it difficult for people to buy new products among others.

More so, and at the intersection of the discourse on market competition and consumer buying behaviour domain, there is also an argument that competition is not just on similar products in LMICs but on wide range of different products simply because different things have to compete for that meagre amount in the hand of a potential buyer or user. Instead of deciding which medicine or healthcare product to buy for instance, in LMICs, a potential buyer might be torn between deciding whether to buy food to eat tomorrow or take medicine today and hope for a better day tomorrow. This practicality is mostly applicable to the case of business-to-consumer (B2C) products but since digital health market is a business to business (B2B) and business to government (B2G) world with over 60% of digital health start-ups that started as a business to consumer (B2C) model pivoting to B2C (Padmanabhan, 2017), the economy even has far-reaching consequences.

Figure 1: Current health expenditure of UK and Nigeria (% of GDP)



SOURCE: World Bank (2019)

Furthermore, organizational barrier as well as behavioural barriers are well established barriers to technology entrepreneurship in healthcare. While the organizational barrier is similar to the structural barrier described earlier, behavioural barrier is however uniquely different in its totality. Several issues constitute the behavioural barriers like the institutional barriers and cultures which are not favourable to healthcare innovation and technology entrepreneurship and professional autonomy of medical professionals which suggest an inherent incompatibility with entrepreneurship among others.

4.0 Summary and Conclusion

As emphasized in the preceding section, the technologically-induced, sovereignty-eroding, globalization, among others, has enabled healthcare dissemination anywhere in the world to be benchmarked with global health practices. Concurrent with this growing need in healthcare delivery is the increasing exacerbation by the poor economic status of the LMICs which made sure their healthcare delivery is not in tandem with the need of the people, and disproportionately so. Many indices and many a research work have categorized these needs in various ways, one of such which established not just the correlation but causal relationship between the disappointing healthcare delivery and poor economic status is Peters, et al. (2008) which categorized healthcare access of LMICs into four broad dimensions of geographic accessibility, availability, financial accessibility and acceptability.

Leveraging technology to provide succour to the highlighted problems of healthcare in the form of technology entrepreneurship through digital health solutions has been emphasized as a means of providing quality, accessible, affordable and available healthcare in different dimensions. This however faces many barriers and challenges in LMICs which were collectively categorized into three thus: structural and economic barrier, organizational barrier and behavioural barrier. These three categorizations encompass the four highlighted challenges in Rivera-Santos, et al.'s (2015) report which they listed as lack of financial capital, low levels of demand for new products and services, inefficient administrative systems, and underdeveloped physical infrastructures among others. These highlighted challenges and barriers are not just particularly applicable to the Nigeria situation as explained earlier, they are ingrained deeply in the health system. As such, understanding these, the problems, is a first and important step towards successfully starting and/ or operating a technology-driven entrepreneurial venture in healthcare.

While not wanting to go out of the report context, it is worth mentioning, even if so briefly, owing to its importance in its application to successful entrepreneurial venture, to glance at the factors

affecting technology adoption in digital health. Many foundational theories as with their postulations have been reviewed in different contexts; countries, cultures, industries as with their lessons (Adebayo & Ofoegbu, 2014; Ahlan & Ahmad, 2014; Ajzen, 1991; Blaya, et al., 2010; Fishbein & Ajzen, 1975). However, and practically, there seems to be too much emphasis on the beauty of the deployed technology and why it's not been adopted using the aforementioned frameworks rather than the suitable solution for the Nigeria populace who have unique intricacies. It is easier to copy solutions deployed in USA and deploy similar in UK as both countries have lots of similarities but such only seldomly work in Nigeria. While this knowledge is a public secret, this practice is still common and was one of the reasons Nigeria technology-driven healthcare entrepreneurship have largely failed.

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