Research Paper

Globalization and Technological Development in Nigeria

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ABSTRACT
This study is on the globalization effects on technological development in Nigeria between the period of 2000 and 2018. The main objective of the study is to assess the influence of globalization on technology development in Nigeria using globalization measurement indicators (FDI, Trade Openness and Exchange Rate) as the independent variable and technological achievement index as the measurement variable for technological development in Nigeria. The research study utilized secondary data sources from the databases of the Central Bank of Nigeria and that of the World Bank respectively. Quantitative method of research was applied using the Ex Post Facto approach. Simple Linear and Multiple regression techniques using SPSS were applied. The results showed that Exchange rate, FDI had positive effects on Technology development while Trade Openness had a negative effect. The findings suggests that there are no practical efforts aimed at taking advantage of technology transfers into the country probably due to the low technological absorptive capacity in Nigeria in addition to a non-effective national innovation system (functional research and development centres). The study recommended the need for Nigeria to take advantage of technology transfers into the country by enhancing their absorptive capacity, developing a national innovation system through adequately manned R&D facilities as this would assist the country catch up through adoption, adaptation and innovation of its own. The country should also imitate the strategies used by China and South Korea in building their innovative capacities.
KEYWORDS:*Globalization, Exchange Rate, Foreign Direct Investment, Trade Openness, Technology, Technological Achievement Index, Nigeria.*

I. INTRODUCTION

1.1 Background to the Study

According to Kavinya (2014), globalization is the enlargedinterdependence and interconnectedness of countries and peoples whichnormallyencompasses the perforation of international borders by increasedrapid flow of information, people, goods, services, finance, and the international-national institutional policy changes that facilitate such flows.Technology is the indispensable force in the contemporary form of commercial globalization. Technology has actually assisted humans in overcoming the critical challenges of globalization,trade barriers, absence of normal ethical standards, costs of transportation and delays in the exchange of information, thuseffecting changes in the market place. The heightened international competition resulting from globalization also contributes to overall wealthsince it reinforces incentives to embrace new technologies and innovations. By strengthening productivity in entirety can uplift average output at relatively low costs.Technological diffusion and technology spread across borders largely increases Technological globalization. In addition, technological advancements in areas like electronic devices (e.g. mobile phones) can result in cheaper prices, increased competition, and improvements in information exchange and mobile banking all at the same time.Technology has facilitated collaboration of software experts in the exchange of ideas and to work over the network with firms worldwide. Technological improvements have assisted a lot in the creation and growth of global markets such as the Multinational Corporations, which are seen as key players in globalization.As seen by numerous types of commerce extended to foreign countries, markets have rapidly become global. Multinationals based in a host country frequently initiate breakthroughs in that country, and thanks to FDIs, multinationals' technological advancement has spread to other countries, facilitating the development of research (Lamba and Malhotra, 2009).

An innovative technology is an improved or new process or product whose characteristics technology-wise are greatly different from previous state. Technological innovation such as wind turbines, photo-voltaic cells, ocean-wave power, solar power and geo-thermal energy etc. enhances productivity levels and brings

humans new and improved services and goods that totally improves standard of living. Given the globalization of production, tech-innovations have fast-tracked the internationalization of markets of which the World Wide Web has assisted in creating an electronic enhanced global market place.

1.2 Statement of Problem

Globalization has contributed to the increased speed of technological diffusion. Cross-border technology transfers have not only impactedon rising local productivity levels in developed and developing economies, but it has also enabled a partial alteration of the technology-innovation landscape. Some receiving countries are now significantly new avenues of research and development inclusive of patents such that the introduction of various technologies has changed the engine of development in developing nations and the nature of foreign trade (Canuto, 2018).

According to Dotta and Munyo (2019), a recent study which included interviews with 100 top executives of large international firms found that 80 percent of business owners attributedremarkable portions of their incomes to innovation.Firms in the United States that considered tech-innovation to be one of their major objectives outpaced their peers that did not consider tech-innovation as priority. This same study discovered that 55 percent of firms in the United States that sold to the local market considered tech-innovation to be a priority, whereasthe firms that sold abroad were 87 percent. This information suggests that, trade openness is not just relevant to foreign trade in terms of facilitating technology transfers, but that firms in international markets allocatehighersignificance to innovation process (Dotta and Munyo, 2019). In the light of the above, the research study is to determine if globalization has actually influenced technology advancement in Nigeria. Past studies have researched globalization against technology but to the best of my knowledge search on various databases, little or none have considered globalization indicators such as trade openness, exchange rate and FDI while testing against the technology achievement index for Nigeria as the technology indicator variable.

1.3 Research Objectives

Based on the above, the majoraim of this research is to investigate the globalization effects on technology advancement in the Nigerian state. Globalization indicators used in this studywere FDI, Exchange rate, and Trade Openness. The precise goals are as follows:
i.   Ascertain the independent effect of globalization indicators on Nigeria's technology advancement.
ii.   Assess the combined influence of the globalization indices on Nigeria's technology advancement.

1.4 Research Questions
i.   What is the independent effect of each globalization indicator on Nigeria's technology advancement?
ii.   What is the combined influence of the globalizationmeasures on Nigeria's technology advancement?

1.5 Research Hypothesis
The following hypotheses were developed in accordance with the study's aims.

Ho_1:   Each globalization measure has no substantial independent effect on Nigeria's technological advancement.

Ho_2:   The globalization metrics have no substantial combined effect on Nigeria's technological advancement.

1.6 Study Scope
Only threeglobalization indicator measures are included in the scope while technological achievement index was considered as the Technology advancement indicator measure. Time series data of over 19years period was usedas obtained from the World Bank and the CBN while Nigeria was considered as the study location.
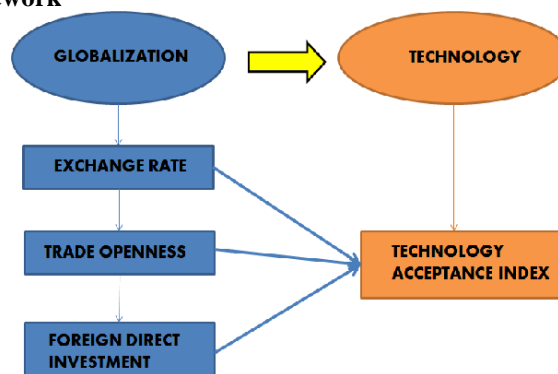
II.   LITERATURE REVIEW

2.1 Conceptual Framework

FIG 1

According to UNCTAD (2021), human development of recent has been complemented by swift changes in technological advancements and an increased proliferation of digitalservices and devices. Frontier technologies such as robotics, artificial intelligence, nanotechnology and biotechnology etc. have seemed to accelerate these technological changes. These advanced technologies have sort of brought about huge benefits visibly felt in 2020 with the advent of the coronavirus vaccines. But rapid technological advances can have some downside effects if they outdo the ability of economies to adapt particularly in poornations like Nigeria where technology knowledge assimilation is quite low. For example, fears that jobs will disappear as more economic activities are automated coupled with the exacerbating stance of the social media in creating doubt and anxiety. Above all, there are some concerns that these frontier technologies will additionally widen inequalities, or enact new ones. A lot of these concerns have been vocalized in developed economies but the consequences could be more terrible for developing nations if poor societies and nations are either submerged or just left behind. The Technology Achievement Index (TAI) is an accepted policy tool, originally designed to evaluate how well countries are actively participating in producing and using technology continuously on a global level. TAI is concerned with issues in technology and innovation, science, human development and economic policy. Technology achievement capacity, diffusion of innovation, knowledge generation and creativity are fundamental factors necessary in providing economic growth and development alongside sustainable competitive advantage (Incekara, Sengun and Guz, 2017). The objective of TAI is to encapsulate the ability of nations to produce new processes and products via research and development, to further diffuse old and new technology in consumption, production and to evolve the human skills for technology innovation and learning. Hence TAI is being adopted as a measure of technology as seen in fig 1 above.

2.1.1   Foreign Direct Investment

Technology and innovation activities occurs mostly in developed economies yet sources of foreign technology accounts for more than 90 percent of local productivity in developing economies of which FDI is used to transfer such technologies as found in studies conducted by Sultana and Turkina (2020), Kwark and Shyn (2006), Bodmanand Le (2011) then Bodman and Le (2013). According to Bodman and Le (2013), FDI is regarded as a critical channel for technology diffusion across boundaries since the flow of FDI embodies knowledge about innovations and technologies, organizational management skills or production methods.Studies of Bodman and Le (2013) confirm that nations that have adopted a moderately more open foreign investment clime have grown remarkably faster than thosethat have not. Their studies further suggest that FDI transfers technological knowledgeand also contributes to the openness to physical investment, trade and financial flows as well as physical capital stock and is regarded asan important driver of growth. They also determined that, in addition to being significant for the direct overall advancement of technical levels, human capital is also vital for the ability to absorb technology from foreign sources.

Recent year have evidenced an enormous growth of FDI which has exceeded both world trade and world output especially with the advent China's FDI in Africa. The growth rate of international production is mostly driven by technological and economic forces alongside trade policies, and FDI liberalization. In this regard, globalization affords an unrivalled opportunity for less developed countries to attainrapideconomic growth via investment and trade. Currently, FDI worldwide has enlarged its significance by technology transfers,creating markets and networks procurement for efficient sales and production internationally (Osano and Koine, 2016). Through FDI, international investors profit from using their resources and assets efficiently, while recipients of FDI benefit from the technology acquisition and from being involved in trade networks and international production. Attracting of FDI has been major driver for Nigeria and other developing nations, in its medium and long term strategy framework. Albeit FDI has increased in recent past in Nigeria, it still remains a bit difficult to exactly quantify the magnitude majorly because of the non-reporting problems. It is even more strenuous to have true estimates of sectorial FDI.

2.1.2   Exchange Rate

Exchange rate changes do not seem to impact most persons in their daily lives, but unintended impacts are more common than many notice. When changes occur in exchange rates, the imported goods prices will alter in value, inclusive of domestic products that depend on imported raw materials and parts. Exchange rate also affects investment performance which in turn can affect the rate of technology transfer to a recipient nation.It should be recalled that investments such as FDI serves as a veritable source of technological transfer to poornations like Nigeria which is supported by Bodman and Le (2013). Real exchange rate drives growth, according to Souto and Resende (2018), as a result of its effects on technological innovation factors, like investment. They did say, however, that the connection between technological innovation and exchange rate is yet unexplored, thus their study attempted to give evidence for the correlation between innovation and exchange rate. Based on Gala (2008), Souto and Resende (2018) stated that discounted currencies can lead to capital accumulation and investments. . They went on to say that expanding tradeable industries accelerates growth

because firms in this sector are far more active and focused on optimizing returns to scale, significantly making more contribution to technical innovation and improved productivity gains than those in non-tradeable sectors.Furthermore, depreciation of the currency will encourage structural changes in the overall economy, leading nations on a consistent growth and sustainable path of development by energizing the most active sector, whose outcomes are more technologically intensive and of which the accumulation of technological advancements and the learning by doing process are superior (Souto and Resende, 2018).An under-devalued real exchange rate reduces share of wages and increases share of profit on income thus enhancing the company's capability in self-financing.This reduces financial scarcity, which hinders research and innovation capital flows, especially in less-developed nations, and accelerates technological progress, which really is a crucial source of prolonged growth (Souto and Resende, 2018). On the other hand, Cheng and Gan (2021) also demonstrated that currency appreciation can encourage firms to utilize local technology-related market facilities for tech-innovation,such that increases in imports due to RMB appreciation can motivate domestic and international firms to improve export competitiveness through increasing levels of technological transactions.Nonetheless, the existence of an advanced National Tech-Innovation System is a necessary condition for the pragmatic impact of a stable and undervalued real effective exchange rate on the flow of information and knowledge, innovation, and learning in a given nation (Souto and Resende, 2018).

2.1.3 Trade Openness

The contribution of trade-openness in promoting economic growth has encouraged an increased number of research studies.The studies asserts that trade-openness maximizes economic growth through attaining resource allocation efficiency, productivity improvement viatechnology diffusion and spillover of knowledge, and giving admittance to services and goods (Ali et al, 2021). Hence, it is of the opinion that more-open countries will do better than less-open countries (Udeagha and Ngepah, 2020; Fetahi-Vehapi et al, 2015). International institutions like the World Trade Organization (WTO) advocatepolicies on trade openness to lead less developed nations into the globalized market as more-open or open-oriented countries witness high growth rates. The trade openness growth sequence is not really stable and such relationship is remarkably influenced by the systemic characteristics of a nation(Ali et al, 2021). Trade openness encourages less developed countries to access much needed investments in human capital in order to address new ways of conducting business by upgrading skills requirement with the aid of technological innovations which can be obtained from developed nations.Skare and Soriano (2021) in their studies of globalization and technology adoptions empirically showed how trade openness being an indicator of globalization has aided the transfer and adoption of digital technologies across nations that have opened imbibed any open economy strategy. The researchers recommended that countries wishing to boost productivity through technological innovation, engage in greater globalization or open-trade practices, in order encourage technological knowledge dissemination and accelerate digital technological development.

Oruma and Amah (2021) also buttressed the immense benefits of globalization via trade-openness to the private and public segments of Nigeria's economy and recommended that the authorities enact policies in support of globalization as the associated advantages outweighs the disadvantages.

2.2 Theoretical Review

Theories supporting technological advancement and globalization include the endo-genous growth theory, international or global trade theory, industrial-organization theory, balance of payment theory, positive spillover theory of FDI, portfolio balance approach theory, new growth theory, and monetary approach to rate of exchange theory. However, theindustrial organization, new growth, endogenous growthand portfolio balance approach theories were applied to the study.

2.2.1 IndustrialOrganization Theory, New Growth Theory, Endogenous Growth Model and PortfolioBalance Approach Theory.

The industrial organization theory, according to Liu and Wang (2003), specifically describes the effect of FDI through transfer of technology, including knowledge diffusion, and the impact of FDI on market competitiveness and structure in host nations. According to the theory, businesses must possess certain benefits in terms of managing the problems of doing business abroad. Enterprises that invest in other countries have distinct qualities that set them apart from companies in host nations; as a result, the impact of a multinational's presence into a host country extends beyond capital importation. FDI is a medium for the transfer of technology and people skills in the host nations, as well as a source of finance.When multinationals expand in host nations, they often bring current technology with them, which gives them a distinct edge and the ability to compete successfully against local enterprises that have a greater understanding of native markets, local business processes, and customer preferences.

FDI is seen as a crucial source for enhancing human resources, pushing technological improvements, and spillovers of innovations among nations in the Endogenous growth model, thus FDI is expected to have a beneficial effect on economic growth. Although the spillover effects that result from FDIs are not always obvious, nevertheless do exist (Liu and Wang, 2003).

According to the new growth theory, a developing country that enshrines high levels of investment (i.e. capital accumulation) and keeps on pushing up the investment rate will mostly attain higher output levels. According to Giwa et al (2020), Solow further applied the theory in 1956 by stating that a permanent rate of output growth vs labour unit of input is independent of the investment rate, which is mostly dependent on the speed of technical progress.The new growth model, in contrast to the preceding neoclassical paradigm, explains technological progress as a form of investment spillovers that emerges from a variety of sources. As a result, it can be deduced that foreign direct investment can result both in domestic investment (indirect effect) and growth (direct effect). However, the magnitude of the impact is very dependent on the quantity of the spillover (Giwa et al, 2020).

The portfolio balance approach theory, like the monetary theory, is an investment view of exchange rate determination that stresses the importance of asset market adjustment with perfect capital mobility assumptions, according to Sulaiman, Obumneke, and Abdelrasaq (2020). In contrast to the monetary theory, it assumes substitutability of foreign and domestic interest bearing assets based on the perceived existence of exchange, political and default risks. The theory posits that exchange rates manifest the demand for and supply of a whole range of assets in various denominated currencies.

2.3   Empirical Review

Cheng and Gan (2021) looked into the stimulatory impact of trade competitiveness on technology transactions as a result of RMB appreciation. The researchers analyzed Chinese regional data over the period from 1998 to 2015 to estimate the stimulatory impact of RMB appreciation on technical transactions via trade competitiveness using the GMM approach. Their findings suggested that a strengthening of the RMB could encourage companies to utilise local technology market capabilities for innovation. Increased imports resulting from RMB appreciation can result in technological spillovers and greatly boost technology commerce. The study also found that the increased export rivalry brought on by RMB appreciation could push international and local enterprises to improve their export competitiveness through improved technology transactions.

Skare and Soriano (2021) looked at how globalization affects digital technology adoption. The enhanced panel data model was used to apply country level data from the digital adoption index, KOF globalization index, total factor productivity and global competitive index to 183 nations. Globalization has a major impact on technological transfers, digital technology uptake, and spillovers in all nations, according to the research. This implies that convergence of digital technological adoption is always experienced by countries that undergo significant technological changes.

Oruma and Amah (2021) examined the impact of globalization on technology in Nigeria. They reviewed different positions of globalization as well as the technology types available and additionally x-rayed their implications within the context of Nigeria. The study concluded that technological globalization leads to expeditious economic growth in Nigeria, and it has been of immense benefits to both the public and private sectors of the Nigerian economy. This has enabled the Nigerian government to stimulate dying sectors of the economy and it was executed via foreign investments and trade, whilst promoting raw materials exports which are generally in abundance. Based on their discoveries, they recommendedthat Nigerian policy makers formulate polices to encouragea thriving of the economy via globalization. They expect the government to enact laws and pursue international protocols and conventions that encourage globalization since the advantages associated with globalization exceed the disadvantages.

Sultana and Turkina (2020) explored the correlation involving FDI and technical advancement to see if the absorptive ability of the receiver matters. The analysis used global FDI networks for the years 2009 to 2016. To verify the validity of their findings, regression analysis was used with instrumental variable estimation techniques. They discovered empirical evidence demonstrating a fundamental pattern in the global FDI network, with core nations being more technologically advanced than peripheral countries. The findings also showed that a country's equilibrium position in the global FDI network is related positively to its technical advancement, and that a country's absorptive capacity might mitigate this relationship. The discovery sheds light on absorptive capacity, demonstrating how a country might profit from FDI by recreating the components that influence absorptive capacity.

Cho and Shenkoya (2019) looked into the economic aspects that influenced decision-making in an international technology transfer, taking into account the views of both the transferor and the recipient. They used a multi-variable evaluation strategy to analyze the issues, which included the creation of a known explanatory framework that may be applied to other studies. Multiple regression analysis was employed as part of the quantitative methodology, which incorporated variables that had previously been addressed separately in

previous studies. The findings revealed that currency exchange rate, FDI, and inflation rate are all economic factors that influence a transferor's choice of a recipient. On the other hand, the findings revealed that, in addition to exchange rate, inflation rate and FDI, official development assistance too is relevant.

Dotta and Munyo (2019) in a quantitative research study analyzed the relationship between a country's trade openness and innovation. Secondary data from the 2016 Global Innovation index for 143 countries were utilized while descriptive statistics and OLS method of analysis were applied. Their findings suggest evidence that public policy which reinforces trade openness has positive impacts on the levels of innovation in countries and such impact is much stronger in emerging countries. In conclusion, opening the country to foreign commerce seems to be the logical choice for energizing the innovation process in businesses.

Souto and Resende (2018) explored the connection between technological innovation and exchange rate in their study of exchange rate and tech-innovation, presenting empirical evidence to support the connection. The panel data approach was employed, and the number of patents was used as an indicator variable for technical innovation, whilst Perée and Steinherr measurement technique of 1989 was used for actual exchange rate indicators, coupled with the mobile standard deviation. The Penn World Table (8.0), the American Patent and Trade Agency website, as well as the World Bank were utilized to create the indicators. From 1996 until 2010, the database was used. In the study, which included 76 nations, a stable cross-sectional dominating panel was used. The GMM-System (generalized method of moments), OLS, Sargan-Hansen technique, Difference-Hansen technique and residual auto-correlation tests were used in the study. The Chow's test, Breusch-Pagan and Hausman tests were additionally applied in the study. Their findings revealed that a decrease in the real exchange rate has a beneficial impact on tech-innovation, corroborating the notion that information flows appear to be a primary channel whereby the connection between tech-innovation and the actual exchange rate arises.

Aslam et al (2018) in their research publication titled 'Globalization helps spread knowledge and Technology across borders', examined how technology travels between countries. Reviews of literatures were done and secondary data (2004 to 2014) were analyzed using descriptive statistical methods. Their research evaluated the degree toward which countries mentioned patented discoveries from technology leaders as previous knowledge in their patent filings to track knowledge flows. Two aspects of the research jumped out. First, in 1995, Europe, Japan, and the United States dominated global patent citations; other Asia (China and South Korea) had gradually increased their use of its global knowledge stock, as evidenced by their patent citations, denoting that globalization enables nations to gain swift access to global-knowledge. Furthermore, links in foreign-knowledge have generally intensified with time, both within and across regions characterized by the intensity of international trade with technology leaders. This confirms that globalization enhances international competition as a result in the increase of developing market enterprises which gives rise to innovations and adoption of foreign technologies. Their study concludes that the technology and knowledge spread across borders has escalated as a result of globalization. In developing markets, technology transfer has helped to improved productivity and innovation even in the current period of low levels of world productivity growth. They urge that policymakers ensure that the beneficial effects of globalization and technical improvements are widely distributed across the population in order to avoid market exploitation and undue control to the detriment of consumers.

Fatima (2017) studied how globalization influenced the invention and spread of technology in 30 emerging and less-developed markets. From 2002 to 2014, secondary data from four series of Enterprise Performance and Corporate Environmental Surveys was combined to see if global exposure leads to a stronger tendency for businesses to be innovative. The feasibility of numerous mediums of global technology transfer, such as importing and exporting operations, international licensing deals, and FDI, is investigated to see if they are effective in motivating enterprises in developing economies to innovate and, as a result, nudge them closer to the world's technological boundaries. The data support the idea that importing and exporting operations, as well as agreements on overseas licensing, are important avenues for technology transfer. Their research recognizes the specific qualities of firms, sectors, and countries, as well as their ability to profit from international exposure.

Ghosh and Sur (2015) in their study of the impact of globalization on India's technology regime, obtained data of 14 manufacturing industries of India for the period of 1996 to 2009 and examined how the R&D expenditure by these companies were affected by liberalization of the Indian economy and FDI. The results of multiple regression analysis and log-linear model indicated that despite the fact that liberalization had expanded the scope of technology imports and goods exports, Indian industries have taken minute advantage of this.

Fard, Cheong and Yap (2014) in their study titled 'reopening the debate on globalisation and economic growth through technology transfer' provided quantitative evidence on the influence of globalisation on growth in the economy and technological transfer. Panel dataset on 140 countries from 1996 to 2010 alongside the dynamic system generalized method of moments (DSGMM), LLC and Sargan tests were applied in the study.

Findings indicate that globalization is not only about trading of goods but also about technology transfer across nations via communication and infrastructure. Results also indicate that globalization influences growth of middle income countries and high income countries with a focus on capital accumulation but the impact was much visible in low income countries. According to the findings, the interchange of ideas has a greater impact on economic growth than the exchange of products, which can lead to increased growth in low-income nations.

Nnanna and Osueke (2013)quantitatively and qualitatively examined the experiences and global managementof technological innovation by the Newly Industrialized countries (NICs) and also draw valuable lessons from them for the Less Developed Countries (LDCs) like Nigeria. A combination of survey research, oral interviews and multistage sampling technique were applied on secondary data obtained from 10Federal ministries, 8 top corporations and 2 top policy decision makers in the industrial sectors in Southeast and western parts of Nigeria.

In their study paper, Gkasis, Desli, and Tsaliki (2013) characterized technology diffusion as the progression of the efficiency gaps between domestic enterprises and conglomerates operating in a nation, and investigated whether this may be attributable to (FDI) Foreign Direct Investment. Data was collected from the Greek chemicals sector from 2001 to 2007 and technological diffusion was measured by the impact of FDI presence on (TFP) Total Factor Productivity. Findings revealed a consistent efficiency performance-gap with multinational enterprises being more effective and efficient than their local counterparts. They also found that technical efficiency performance greatly depends on firm specific traits such as already achieved technical efficiency levels, levels of self-financing, size of firm, returns on assets, in addition to the presence of FDI. Generally, only existing technically efficient firms have the capacityof benefitting from FDI presence.

Bilgin et al. (2012) investigated the factors of small and medium enterprise success in their paper titled 'Tech transfer, Financing Channels, and Performance Of small and medium enterprise: New Facts from less developed nations.' By examining the factors of profitability per worker, they looked into how coaching, technology adoption, financing channels, and export attitudes affect SME success. They discovered proof that SMEs might increase performance by bringing in foreign components and adopting foreign technology from technologically developed nations employing micro-econometric modeling on a secondary firm level data. Because in-house innovation is costly, this technology spillover effect is especially useful for smaller enterprises in developing countries. They also discovered that both official and unofficial financing sources don't really improve the efficiency of small businesses when it comes to financing business operations; rather, unofficial finance sources impede an enterprise's efficiency. There was no indication that on-the-job training had any effect on business performance.

A qualitative study titled 'Developedand less developed Country-wide Alignment: Advantages to Advanced Nations' was done by Siyed et al (2012). Their research paper looked at necessary literature to gather evidence for international collaboration, particularly between developed and emerging nations. Publications studies in English between periods of 1990 and 2010 containing secondary data relating to foreign cooperation between developing and developed countries (Africa, Asia, Europe and North America) were used for the analysis. Out of 227 articles obtained via embryonic screening, 65 were added in the concluding analysis. The findings were dual-fold: few articles pointed to impalpable benefits ensuing from developed country-partners, but most of the information pointed to developing country-innovations that can assuredly inform health systems in advanced countries. The information covered all six WHO health-system components. Whilst there are no assurances that innovations from developing countries experiences can successfullybe transferred to developed countries, incorporated developed-developing nation learning processes can definitely generate effective solutions for global-health systems. They conclude that their findings provide insights on how technological-innovations in developing nations can inform responses to present-day health system problems in developed countries as a result of globalization.

In their study paper titled 'Trade and Technological Capabilities: Proof from Turkish Dataset,' Meschi, Taymaz, and Vivarelli (2011) used firm-level secondary information to show an irrefutable relationship between technology acceptance, Open trade, and the demand for skilled labourers inside the Turkish manufacturing sector from 1980 to 2001. They estimated an enhanced cost-share formula where the wage-bill portion of skilled labour in a given organization is connected to overseas exposure and technological adoption utilizing a panel data environment and a unique dataset available across 17,462 firms. In the case of middle-income nations like Turkey, the data demonstrated that R&D expenditures were positively significant and associated to enhanced skills, supporting the skill-based technical-change argument.They also looked into the real impact of importation-flows on determining the corresponding skill requirements, and the findings revealed that businesses in the categories that saw a rapid rise in the share of inputs brought into the country from developed economies also saw a rapid increase in the labour cost portion of the skilled workforce. These findings back with the hypothesis that trade openness stimulates foreign imports from developed economies, resulting in the transfer of new technology and a rising request for skilled labour.

In one of their articles, Meschi and Taymaz (2008) used 88,561 firm-level data from 1980 to 2001 to investigate the connection between open trade, tech-adoption, and the request for skilled labour in Turkey's manufacturing industry. Overall, the data show that open trade and technology are important in communicating workforce demands to skilled individuals in an organization. Firms that increased their imports also saw bigger rises in the labour cost proportion of skilled labour, according to the findings. Their findings support the theory that developing-country imports imply the transfer of new, highly skilled-intensive technologies not previously available in local markets.

Lal (2007) in his study of globalization and the adoption of ICTs in Nigerian SMEsinvestigated the factors affecting the degree of adoption of new technologies in Nigerian SMEs. Data from 67 SMEs with locations in Ibadan, Aba, Nnewi and Lagos were utilized using multivariate analysis. Findings suggest that firm-level variables such as technological absorptive capacity and financial capacity influenced the potency of the adoption of ICTs. The findings also suggest that globalization of the Nigerian economy additionally influenced the adoption of new technologies. The research study infers that SMEs need institutional assistance in the development of human resource to augmenttheir competitiveness both in the localand international markets.

Carl (2006) tracked the importance of technology on the growth of the economy and its competitiveness in a quantitative and qualitative analysis, and described the tactics of the fastest rising economies over the past 50 years from the standpoint of their technology strategic orientation. He also outlined some of the important global dynamics that are making it more difficult for developing countries to replicate the rapid growth of the mentioned countries, as well as the impact of China's growth on developing countries. The study's main findings are that technology is becoming a more critical component of globalization and determination, and that the rapid pace of technological change and the preconditions required to effectively partake in globalization are making it even more complicated for many developing countries to compete. To succeed in the ever-demanding and twisted global economy, he suggested that emerging countries develop additional technology capabilities and greater flexibility. Furthermore, globalization and increased global competition should be fought, as they lead to powerful protectionist absence in both emerging and rich countries. If rich countries focus on increasing their flexibility in adapting to the growing comparative advantage resulting from rapid technological development, and developing nations focus on extending their technological capabilities, infrastructures, and education, the world will be a better place. However, there are significant imbalances in the globalized world, necessitating significant efforts to provide some transfer mechanisms and world balancing.

Yauri (2006) investigated the vertical effects of FDI on Nigerian manufacturing firms in an attempt to establish whether manufacturing firms in Nigeria that receive FDI, benefit from technology flows which comes along with foreign capital. The study employed secondary data (2001 World Bank Nigerian Manufacturing Survey) and probit regression as analysis technique. Their findings found that Nigerian firms that received FDI employed more technology than non FDI firms, practically due to the foreign capital influence. The study concluded that FDI is beneficial to manufacturing firms in Nigeria, since one of the critical constraints to Nigerian manufacturing firm's productivity is lack of technology. The study recommendedfor Nigerian manufacturing firms to consider FDI as a strategy for addressing the technology dearth being faced as foreign investors have high access and information on technology sources. In addition, their capital contributions will boost the firm's potential to get hold of technology.

In their study on the impact of the real exchange rate on technological advancement, Cortese and Hua (2002) used panel data by sector and the stochastic frontier approach alongside descriptive statistics to quantify technical progress for 26 Counties. Year periods are 1980, 1884-85, 1988-1994 and 1997. Exchange rate is considered as the independent variable while technological progress was considered as the dependent variable.
The findings show that real depreciation played a crucial role in the textile-clothing sector's technological catch-up process until 1993, whereas real appreciation after the unification of currency rates in 1994 delayed the process. This study shows that the Chinese government considers the real exchange rate influence on technical progress rather than only exports when making exchange rate policy decisions.

Liu and Wang (2002) investigated the impact of foreign direct investment on TFP in a cross-section of Chinese manufacturing sectors. The researchers looked for possible factors of total factor productivity, with an emphasis on FDI. The study's theoretical framework was explained using industrial organization, global commerce, and endogenous growth theories. The endogeneity test was used to ensure that the results were consistent. According to the findings, the most important elements favouring TFP in Chinese industries are firm size, international presence, and the degree of R&D. The study's findings back up the idea that obtaining foreign direct investment is an efficient way to introduce innovative technologies to host nations.

III.   METHODOLOGY

In this section, a quantitative method of analysis was utilized. The Ex Post Facto research design alongside the causal-comparative research design was employed in the study. This was as a result of the specific objectives of the study inclusive of the use of historical data in the study.

3.1   Data Source

Secondary data was used andsourced from theWorld Bank 2021 database and the Central Bank of Nigeria2019 statistical bulletin.

3.2   Data Analysis

Data collated was analysed using simple and multiple linear regressions. Technology achievement Index(TAI) was used as an indicator for Technology development. Trade Openness (TOP), Exchange Rate (EXR) and Foreign Direct Investment (FDI) were regressed against TAI.

3.3   Model Specification

The theories utilized for the study were the Industrial Organization Theory, New Growth Theory, Endogenous Growth Model and Portfolio Balance Approach Theory. The theories indicate that the globalization variables under study can influence the technology development of Nigeria by Technological achievement index (TAI). Thus, in specifying the model [(TAI= f (globalization)], significance is placed on asserting if globalization represented by foreign direct investment (FDI), exchange rate (EXR) and trade openness(TOP) have any remarkable influence on technology development (represented by TAI). The study applied the simple and multiple linear regressions to estimate and test the model specification. The simple linear regression was used to test the null hypothesis one (**Ho$_1$**) by ascertaining the strength of each independent variable on the dependent variable as represented below:

TAI = f (FDI) = W_0 + W_1FDI + et ………… (1)
TAI = f (EXR) = W_0 + W_1EXR + et ………… (2)
TAI = f (TOP) = W_0 + W_1TOP + et ………… (3)

The multiple regression model as expressed below was used to test the null hypothesis two (**Ho$_2$**) and ascertain the significance of the combinedeffect of the independent variables on the dependent variable. SPSS 25 was used to carry out the regression analyses:

TAI = f (FDI, EXR,TOP) = W_0 + W_1FDI + W_2EXR + W_3TOP + et ………… (4)

Where TAI = technology achievement index, Z_0 = intercept, Z_1 to Z_3= coefficient of the variables, FDI = foreign direct investment, EXR = exchange rate, TOP = trade openness and et = stochastic term (error term).

The a priori expectations are **W_1, W_2, W_3> 0**

3.4   Data Presentation

Presented below is the data used for the analysis which was sourced from the databases of the Central bank of Nigeria and the World Bank.

Year	Technology Achievement Index	Exchange Rates	Trade Openness	FDI($Bn)
2018	0.225900848	306.0802	0.330068733	2
2017	0.225902895	305.7901	0.263473054	3.5
2016	0.145210808	253.4923	0.207216113	4.45
2015	0.223385491	193.2792	0.213311422	3.06
2014	0.125803849	158.5526	0.308846126	4.69
2013	0.125405515	157.3112	0.310483792	5.56
2012	0.104089013	157.4994	0.445334797	7.07
2011	0.08613013	153.8616	0.532803279	8.84
2010	0.0721039	150.2980	0.433187628	6.03
2009	0.079226892	148.8802	0.360593395	8.56
2008	0.069044478	118.5669	0.407963446	8.19
2007	0.056422468	125.8331	0.393353409	6.04
2006	0.050034831	128.6516	0.42566709	4.85
2005	0.039457883	132.1470	0.330608074	4.98
2004	0.026726056	133.5004	0.318938339	1.87

2003	0.022419688	129.3565	0.493375274	2.01
2002	0.021085601	120.9702	0.400356431	1.89
2001	0.019762791	111.9433	0.496690531	1.19
2000	0.000616162	102.1052	0.489992801	1.14

Source: Author's compilation from CBN & World Bank Databases, 2021

IV.   FINDINGS AND DISCUSSIONS

In response to research question one and **Ho₁**, an assessment of the independent effect of globalization variables was carried out using a simple linear regression and the results were collated into Table 4.1

Table 4.1: Simple Linear Regression Results Globalisation Variables

VARIABLES	R^2	F-Statistic	t-Statistic	Significance (P-value)
Exchange Rate	0.777	59.090	7.687	0.000
Trade Openness	0.461	14.516	-3.810	0.001
Foreign Direct Investment	0.004	0.066	0.257	0.800

Dependent: Technology Achievement Index   Source: SPSS Result, 2021.

Exchange rate returned R square value of 0.777 which implies that 77.7 percent of the changes in Technology Achievement Index are affected by 77.7 percent of the changes in exchange rate. The F-statistic (59.090) and P-value showed that the model was significant and that there was linear relationship between exchange rate and Technology Achievement Index. The t-statistic of 7.687 showed that there is a significant positive relationship between exchange rate and Technology achievement in Nigeria (p-value < 0.001).

Trade Openness R square value of 0.461 which implies that 46.1 percent of the changes in Technology Achievement Index are affected by 46.1 percent of the changes in trade openness. The F-statistic (14.516) and P-value showed that the model was significant and that there was linear relationship between exchange rate and Technology Achievement Index. The t-statistic of -3.810 showed that there is a significant negative relationship between trade openness and Technology achievement in Nigeria (p-value < 0.001).

Foreign Direct Investment returned R square value of 0.004 which implies that 0.4 percent of the changes in Technology Achievement Index are affected by 0.4 percent of the changes in Foreign Direct Investment. The F-statistic (0.066) and P-value showed that the model was significant and that there was linear relationship between Foreign Direct Investment and Technology Achievement Index. The t-statistic of 0.257 showed that there is insignificant positive relationship between Foreign Direct Investment and Technology Achievement Index in Nigeria.

In response to research question two and **Ho₂**, the joint effect of globalization indicators on technology development in Nigeria were ascertained by regressing against TAI and the results are presented in Table 4.2.

Table 4.2: Multiple Linear Regression Results

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.914ᵃ	.835	.802	.03196358

ANOVAᵃ						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.078	3	.026	25.317	.000ᵇ
	Residual	.015	15	.001		
	Total	.093	18			

Coefficientsᵃ						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.010	.059		-.174	.865
	Exchange Rate	.001	.000	.756	5.703	.000
	FDI	.005	.003	.165	1.566	.138
	Trade Openness	-.176	.100	-.233	-1.760	.099

Dependent Variable: Technology Achievement Index
Source: SPSS Results, 2021.

The model returned R square value of 0.835 which implies that 83.5 percent of the changes in the independent variables: exchange rate, trade openness, and foreign direct investment can influence 83.5 percent of the changes in the dependent variable Technology Achievement Index which was used as a measure of

technological growth in Nigeria. The F-statistics (25.317) and the P-value (0.000) showed goodness fit of the model which implies that there is a linear relationship between the Technology Achievement Index and the indicators of globalization. Thus, the indicators of globalization have statistically significant relationship with technological growth in Nigeria.

4.1 Policy Implication of Findings

The outcome of the analysis depicts the importance of globalization in an organized economy. However, result for trade openness indicated deficient globalization outcomes since it does not drive technology development. This situation can be attributed to the lowtechnological absorptive capacityin Nigeria coupled with an absence of a well-developed National Innovation System. A cue can be taken from China that took threw open their economy to investors who brought technological innovations alongside their investments. These technologies were thereafter reconstructed and adopted through high levels of absorptive capacity among its citizens leading to setting up of Research and development centres for continuous learning and innovations.

V. CONCLUSION AND RECOMMENDATIONS

This study examinedthe effect of globalization on technology development in Nigeria using time series data (2000 to 2018). A regression analysis was applied to ascertain the effect of the various globalizationvariables (exchange rate, FDI and trade openness) ontechnological development (determined by technological achievement index) in Nigeria. The globalization variables were tested independently and jointly for their statistical significance on technology development in order to determine the variation of the model and the relative contribution of each globalization indicator to TAI. The study discovered that globalization (Exchange rate, Trade openness, FDI)has contributed to technology development in Nigeria which can be supported by similar research studies of Aslam et al (2018); Skare and Soriano (2021); Dotta and Munyo (2019) . However, only exchange rate and Foreign direct Invest (FDI) contributed positively to technology development while trade openness contributed negatively. This inverse relationship discovery suggests that there are no practical efforts aimed at taking advantage of technology transfers into the country probably due to the low technological absorptive capacity in Nigeria in addition to a non-effective national innovation system (functional research and development centres).Despite the persistent technology-gaps, Nigeria can still catch up through adoption, thereafter adaptation and innovation of its own. That has always been the stand-point taken by China and then South Korea, which are currently engaged in the innovation of their respective products and services. Excerpts from WEF (2018) revealed that while China and South Korea are still treated as beneficiaries of flows in global knowledge, they are also on their own way ineven becoming important sources. For any developing economy, prosperity depends on the availability of a widerange of complementing factors: quality infrastructures, access to finance, solid organizational and managerial practices and adequate skilled labour. Market induced failures should not be accepted to subvert the motivation to accumulate tech-knowledge. Transaction costs relatedto doing business (e.g. hiring and enforcing contracts and trading across borders) must be placed under check. Without these supportive factors, investments in the expansion of innovative capabilities will surely bring meagre returns. This additionally proffers reasons whytechnological transformations have not been as rapid or intense as one might envisage in Nigeria and other less-developed nations. Globalization has hitherto been shown to possess extensive potential to strengthen technological innovations, productivity, and growth. Instead of opposing it, developingeconomies such as Nigeria should be encouraged to build their capacity and take swift advantage of it.

5.1 Further Areas of Research

Further research is suggested in using other globalization representative variables in the assessment of the extent of its influence on technological development in Nigeria and possibly other African countries for comparative purposes.

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