



Digital Entrepreneurial Behaviour of Millennials in the Fourth Industrial Revolution in Southwest Nigeria

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ABSTRACT

This paper examines the Digital Entrepreneurial Behaviour (DEBs) of the Nigerian Millennial and makes conceptual contributions to the literature on how their digital entrepreneurial conduct influences the Fourth Industrial Revolution (4IR) in Southwest Nigeria. The study adopted survey research design targeting the population of Millennials across the six States in Southwest Nigeria. A total of 900 Millennial-technopreneurs who are engaged in Digitally-based Enterprises (DBEs) were sampled in the States using purposive and snowball sampling techniques. The study revealed that the majority (91.67%) of the Millennials possessed thorough knowledge of Innovative Digital Technologies (IDTs) with 61.32% engaged in DBEs. The DBEs are cloud computing, data analytics, machine learning, mobile development, data visualisation, FinTech, blockchain technology, software development, data engineering, cyber security and internet-of-things (IoT) which are acknowledged to be the building blocks of the fourth industrial revolution. The study further reveals that the factors that influence the engagement of the Millennial in DBEs were entrepreneurial alertness, personal exploits, business innovation competitions/innovation challenge programmes, attendance at seminars and workshops and enterprise innovation foundations. All these factors contribute 74.1% (R^2 value of 0.741) to the Millennial's engagement in DBEs. The study concludes that the knowledge and entrepreneurial behaviours of the Nigerian Millennial in DBEs is relatively high with potentials for 4IR in Nigeria. The paper discusses the policy implications of the findings and implications for future research on 4IR in Nigeria.

Key words:

Innovative Digital Technologies, Millennials, Fourth Industrial Revolution, Innovation, Digitally-based Enterprises.

1. Background Information

The Fourth Industrial Revolution (4IR) is driven by a range of Innovative Digital Technologies (IDTs) that impact on the performance of Digitally-based Enterprises (DBEs) towards achieving sustainable industrial development in Nigeria. The 4IR is accompanied with new practices of technologies for the digitalisation of economies in both developed and developing nations across the globe (Enaifoghe, 2021). These new set of technologies gifts opportunities for industrial development and economic growth. The 4IR brings new prospects to grow from the opportunities of emerging technological standards that serve as a window of opportunity for countries. Industrial revolution accelerates economic development and creates new opportunities in which Nigeria can align with developed markets for the benefit of both public and private sectors. Moreover, IDTs could create entrepreneurial alertness among Millennials; that is persons who were born between 1980 and 2000. The explosive growth in information and communications technologies (ICTs) and other digital knowledge have also brought a major impact on the ways enterprises bring value to their customers. ICTs have made the world a smaller place and have brought nations closer through globalization and provided new techniques for creating products and services tailored to individual customer needs. Relationships exist between ICTs and industrial growth in many nations of the world which impacts on product innovations by allowing companies to better understand markets (Adeoti, 2019). ICTs also impact on process innovations by supporting organisational improvement efforts aimed at flexible production, lowering the cost of production as well as achieving the quality and cost requirements of customers. Consequently, millions of DBEs are being launched globally in various industries. The industrial development and revolution through economic digitalisation involves advanced technology reducing the costs of collecting, distributing and analysing available data (Simcoe, 2012; Enaifoghe, 2021). The advancement in digitisation has facilitated technology-based enterprises otherwise called Technopreneurship because of its high influence in automating production. The shift towards digital-based industrial sectors for sustainable development has drawn the attention of researchers

and policy makers around the world. These digital enterprises include artificial intelligence, machine learning, data analytics, internet-of-things (IoT), robotics, mobile development, data visualisation, cyber security, data engineering, block-chain, cloud computing, cryptography, and computer network security. These skills which are common among Millennials create entrepreneurial alertness among them for emergence of the 4IR (Dada, 2020). According to Adeoti (2019), many of the largest companies in the world are digital-based and software companies built and managed by Technopreneurs who are engines for smart economic development and triggers for industrial advancement. A few examples of Technopreneurs in the world are Bill Gates (Microsoft), Steve Jobs (Apple), Larry Ellison (Oracle), Jeff Bezos (Amazon), Sergey Brin and Larry Page (Google), Mark Zuckerberg (Facebook), Jack Ma (Alibaba), Jack Dorsey (Twitter), and Kevin Systrom (Instagram) among others. These companies have thrived over the years with technologies that are products of knowledge of information technologies. Moreover, young Technopreneurs are succeeding with new enterprise models through the application of new technologies. Familiar examples are Jumia, Konga, Uber, Airbnb, e-Wallet, O-pay, and Farmcrowdy.

Several African countries such as South Africa, Kenya, Uganda, and Zambia have struggled to implement policies to develop ICT skills and programmes in their educational sectors. These countries have tried to close the digital skills gap for effective industrial development and also leverage on digitalisation for boosting their economies. As enunciated by Enaifoghe (2021), the industrialisation of Africa which according to Myers (2019), has the largest share of young people in its population in the world, can accelerate and promote African economic development. More Millennial Technopreneurs with requisite digital skills are needed in the African continent to implement digital economic development and transform the industrialisation base. This will involve the fusion of available human and technological resources in African countries including Nigeria (Manda and Dhaou, 2019). In Nigeria, some Technopreneurs have evolved and made an impact on the economic growth and

development of the Country. These include but are not limited to Nnamdi Ezeigbo, the Founder and Chief Executive Officer of Slot NG and Founder of Tecno-Mobile which captures 61% of mobile industry in Nigeria and Seun Runsewe, the head of product at O-pay which has marketed 50 Million Dollars for product development and market acquisition. Other Millennial Technopreneurs are springing up; given hope to the 4IR in Nigeria. Harnessing technology, innovation, and digital skills have the potential to create more value and drive sustainable and inclusive growth towards the 4IR in Nigeria. Dasgupta (2018) argued that the disruption of digital technologies of digitalisation facilitated value creation and offers development opportunities through social interaction as well as the way businesses are conducted. This is in line with the Sustainable Development Goals (SDGs) number nine, which is, to build resilient infrastructure, promote sustainable industrialisation and foster innovation. Equipping the Millennial with the right digital skills for entrepreneurial alertness is germane for them to become successful Technopreneurs. The Millennial could be the most entrepreneurially alert age group known for creating technological enterprises rather than choosing paid jobs. The contributions of digital skills and entrepreneurial alertness can provide a roadmap for Nigeria to achieve social and economic development goals and derive her share of the \$11.5 trillion global digital economy (Microsoft, 2020). The more the high growth skills, entrepreneurs and start-up companies that can be generated in the Nigerian economy, the more the movement towards the 4IR in the Country. Cultivating such high-growth entrepreneurs and high-growth start-up companies for economic development is expected. Several support innovation policies that focus on creating a new breed of Technopreneurs towards the 4IR has been entrenched such as Innovation for economic development (IFED) policy by the Lagos State government in Nigeria. The Federal Ministry of Communications and Digital Economy (FMoCDE) also launched the National Digital Economy Policy and Strategy (NDEPS) to provide a framework that will ensure active participation of Nigeria in the emerging digitally driven economic development. Technopreneurs exploit and create value to meet the market needs of their customers through digital

skills developed from existing scientific and technological knowledge. The main focus of this paper is therefore, to evaluate the influence of IDTs of the Millennial on the 4IR in Nigeria with a focus on the Southwest zone of Nigeria. The paper is informed by the need to determine the IDTs capabilities of the Nigerian Millennial as driver of the 4IR. The motivation is to stimulate policy debate on the influence of digital skills and entrepreneurial alertness on industrial revolution in Nigeria and to influence government policy for addressing Nigeria industrial and employment challenges.

2. Review of Related Literature

2.1 The fourth industrial revolution

The Fourth Industrial Revolution (4IR) is a collective term for the change in production patterns enabled by the convergence of the physical and digital spheres. [Ndung'u and Signé \(2020\)](#) posited that the 4IR is synthesised digital, biological and physical knowledge and the utilisation of new technologies such as artificial intelligence, cloud computing, robotics, 3D printing, the Internet of Things, and advanced wireless technologies. The 4IR is accompanied by new practices of technologies for digitalisation of economies in both developed and developing nations across the globe ([Enaifoghe, 2021](#)). These new sets of technologies gift opportunities for industrial development and economic growth. The 4IR gives new prospects to grow from the opportunities of emerging technological paradigms that may serve as a window of opportunity for Nigeria. The industrial development and revolution through economic digitalisation involves advanced technology reducing the costs of collecting, distributing, and analysing available data ([Simcoe, 2012](#); [Enaifoghe, 2021](#)). Industrial revolution accelerates economic development and creates new opportunities in which Nigeria can align with the developed markets for the benefit for of both public and private sectors.

The 4IR offers new opportunities for Nigeria to transform its economy through digitalization of the various sectors of the country. The need to reasonably understand the impact of the digital-driven revolution can be done by assessing the consequences of digitalising the economy and

transformation on skills, jobs, work systems and larger society (Manda and Dhaou, 2019). The industrialization caused by the 4IR can provide massive opportunities with a renewed and exceptional opportunity to address the problem of unemployment in Africa. The 4IR has triggered innovative changes in industrial and other sectors in the economies of many countries. The 4IR world however, requires considerable digital skills and understanding of how the smart environment functions to effectively communicate and interact with the public (Adeoti, 2019). The 4IR can result in new, safer and more functional products, as well as more efficient production which can open new markets and boost economic growth and development in Nigeria. The 4IR is a source for unlimited business opportunities where entrepreneurship is easier through new technology. In Nigeria, the interaction of weak competition in product markets and dysfunctional labour markets is affecting industrial growth leading to high unemployment.

2.2 Innovative digital technologies

Globally, Innovative Digital Technologies (IDTs) are supporting and advancing increasingly integrated services throughout industrial value chains. The spread of IDTs over the last two decades has been rapid and generated a lot of excitement about the possibilities of the digital age (Adeoti, 2019). IDTs penetrate and restructure all aspects of socio-economic activities resulting in the creation of new products, services, innovation and business opportunities (Ciarli *et al.*, 2021). IDTs offer opportunities for companies and workers, with more flexibility and possibilities to improve work-life balance, learning and work opportunities leading to overall high performances. Access to IDTs has also provided opportunities that were previously out of reach to many individuals and enterprises. For instance, about 8 million entrepreneurs (one third of who are women) in China use e-commerce platforms to sell their goods. Digital identification in India has reduced corruption and increased access to services. Millennial entrepreneurs need appropriate IDTs to enable them to utilize and grow their businesses apart from taking advantage of all the opportunities for economic, social and personal development for the fourth industrial revolution. IDTs and the

digitisation of business activities impact on various aspects of industry and society (Microsoft, 2020). Globally, millions of digital start-ups are being launched, with business models in various industries while others are reinventing their business models and investing funds in new digital infrastructure and capabilities with new opportunities arising from the digital technologies (Microsoft, 2020). The shift towards digital-based economies for sustainable economic development has therefore drawn the attention of researchers and policy makers around the world. IDTs attempt to integrate artificial intelligence (AI), Internet of Things (IoT) and robotics to process big data and feed information back into automated and self-learning systems and processes (Hatani, 2020; Khare *et al.*, 2020). Adoption of digital technology has therefore, caused process disruptions in both the manufacturing and service sectors and led to new business models and new products (Khare *et al.*, 2020). Digitalisation is used to empower people and communities to exercise their choices and to engage in economic, social and political activities in smart cities. The digital economy has brought new business models and rapidly expanding industries where new businesses are challenging existing businesses in novel ways (OECD, 2015). Competition in the digital economy could be affected by many factors, including network externalities which can lead to growing concentration in such markets. The expectation for greater productivity and opportunity for governments and industries have not been widely spread as expected. As stated by MEP (2016), 4 billion digital technologies are spreading across the globe, but 4 billion people still do not have access to the internet (MEP, 2016). For most modern industrial companies, the manufacturing and services stakeholders are so highly intertwined that categorizing them into different sectors is difficult (OECD, 2017). With collective responsibilities of government, industry and knowledge institutions, digital technologies can be powerful sources of goods and services for maximized economic benefits.

2.3 The millennial generation

The Millennial generation consists of those young people who are less concerned with social conditions in politics and economics (Jamaluddin

et al., 2020). The Millennial generation is implicit from two perspectives; the year-of-birth perspective and the behavioural perspective. From the perspective of the year-of-birth, the Millennial generation are those who were born between 1980 and 2010 and who are known for turning down well-paid jobs in favour of business opportunities for greater industrial and economic influence (Dada, 2020). They are talented and motivated people who seek opportunities to act on their ideas and dreams. The behavioural perspective in the Millennial generation, is also known as google or internet generation. The Millennial generation is distinct by the increasing use of information and communication technology tools like the internet, MP3 players, YouTube, Facebook, Instagram, and smartphones. The Millennials are innovators, because they learn, adapt and work in an environment of innovation that relies heavily on technology to make changes in various aspects of life that greatly affect the mindset, values, and behaviours adopted (Al-Walidah, 2018; Sutijono and Farid, 2018). They have capabilities in the world of existing technology and facilities with many opportunities to be ahead of previous generations for industrial revolution.

2.4 Entrepreneurial alertness

Entrepreneurial alertness is an individual's ability to perceive new opportunities that are overlooked by others with an inclination to start a new enterprise (Kirzner, 1997). Entrepreneurial alertness is a key determinant of the action of new venture creation moderated by factors such as personal exploits, government policy, family background, position in one's family, parents' occupation, education and training (Siyanbola, *et al.*, 2012; Dada, 2019). The impact of entrepreneurial alertness has been to recognize the crucial factors that help youths understand and foster entrepreneurial attitude. Entrepreneurial alertness consists of three distinct features. These are scanning and searching for information, connecting previously-disparate information as well as evaluation of the existence of profitable business opportunities (Tang *et al.*, 2012). As explained by Kirzner (1973, 1997, 1999), entrepreneurial alertness is a process and perspective that helps some individuals to be more aware of changes, shifts, opportunities and overlooked possibilities.

Moreover, entrepreneurial alertness has the potential to significantly add to the understanding of how new ideas get initiated and pursued. Entrepreneurial alertness allows individuals to have a unique preparedness and consistency in scanning the environment in readiness to discover opportunities (Kaish and Gilad, 1991). Scholars like Ardichvili *et al.* (2003), Baron (2006) and Tang *et al.* (2012) posited that entrepreneurial alertness involves a proactive stance based on a number of intellectual capacities and processes such as prior knowledge and experiences, pattern recognition, information processing skills as well as social interactions. Entrepreneurial alertness can serve as business intelligence that helps entrepreneurs envision the future with viable business opportunities (Kirzner, 1999). Moreso, entrepreneurs make their judgments based on their patterns to clarify what the associated information entails based on market need (Dutta and Crossan, 2005). Entrepreneurial alertness therefore, remains a central part of theoretical models seeking to explain the identification of new opportunities (Ardichvili, *et al.*, 2003; Baron, 2006).

2.5 Conceptual framework

This portion of the paper designs a framework on how the Fourth Industrial Revolution (4IR) can create opportunities for sustainable development in Nigeria. Figure 1 shows the innovative digital technologies for the Millennial's engagement in Digitally-based Enterprises (DBEs) and 4IR in Nigeria. The Framework describes innovative digital technologies to include Smart Sensors, Artificial intelligence-based system, Internet-of-things, Robotics and Phythons among others. The Framework further reveals that several factors have contributed to this trend, such as entrepreneurial alertness, technological adaptations, personal exploits, business innovation competitions, enterprise innovation foundations, entrepreneurship mentoring programmes, industrial work experience and entrepreneurship education. These factors are affected and translated into the 4IR. The 4IR include computer-integrated manufacturing, smart manufacturing, cloud computing, machine learning, mobile development, blockchain technology, software development and others. As argued by Enaifoghe (2021), the advent of 4IR has brought about new forms of technologies

with opportunities for economic growth and development though with unexpected and inevitable challenges. The 4IR offers new prospects and exceptional opportunities to address the problem of unemployment in Nigeria. Through the 4IR, the Nigerian economy can be developed through technological advancement. The Framework suggest that all actors of the national innovation system in Nigeria, that is, the policymakers, the researchers, the industrial players as well as the financial sector are required to equip themselves with the right knowledge on 4IR for the achievement of inclusive and sustainable development.

3. Methodology

This study adopts survey research design with two research instruments- a set of questionnaire and interview guide. The target population consists of all Millennials across the 6 States in Southwest Nigeria. Southwest Nigeria was chosen due to high industrial settings that can conveniently represent Nigeria in this direction. According to Myers (2019), Nigeria has the youngest population in the world. The country is the most populous country in Africa and the seventh most populous country in the world. Nigeria is divided into six geopolitical zones in which the Southwestern Zone is very prominent among them. Southwest Nigeria consist of six distinct States namely;

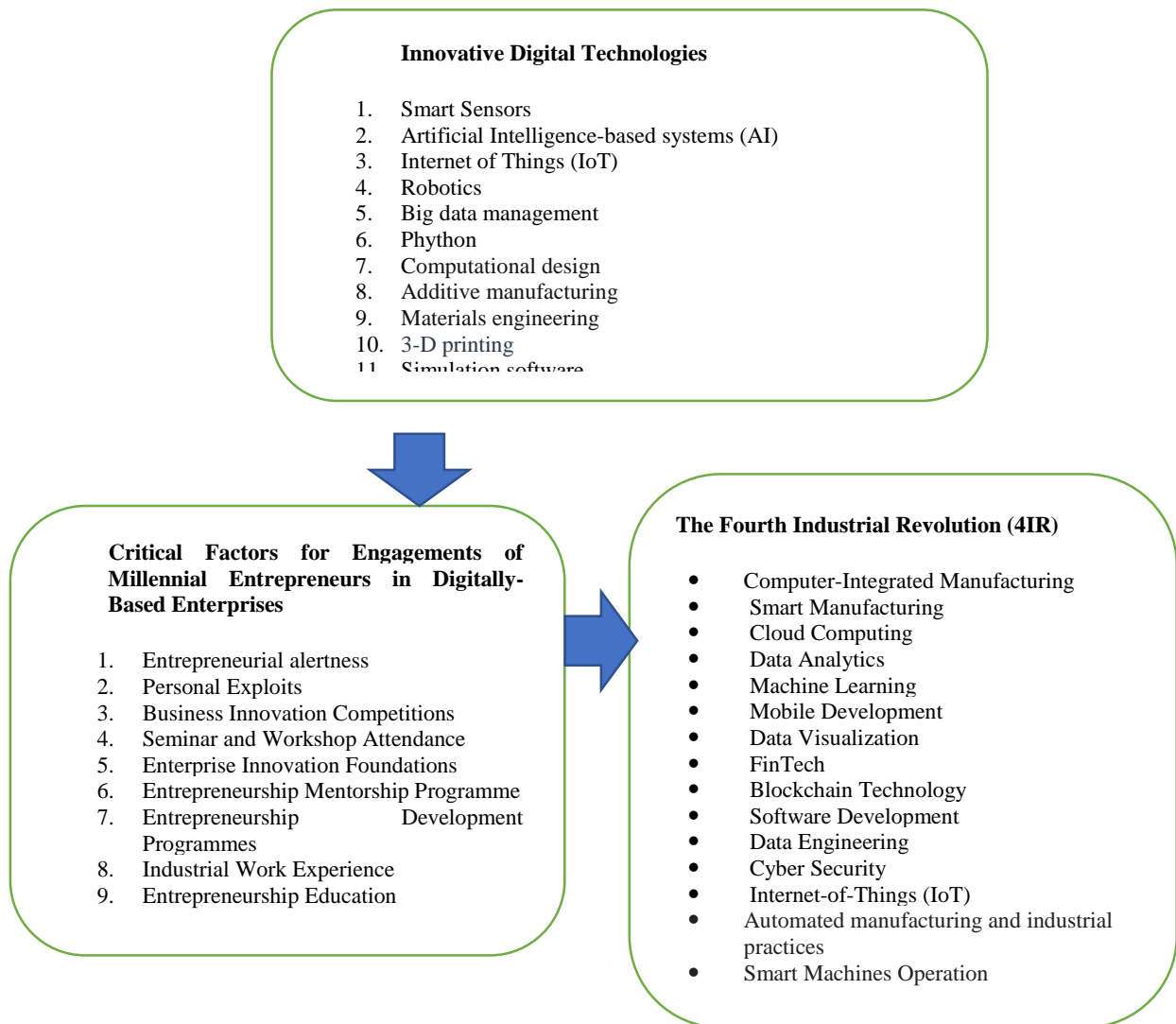


Figure 1: Conceptual Framework on Innovative Digital Technologies, factors for the Millennial’s Engagement in Digitally-Based Enterprises and Fourth Industrial Revolution in Nigeria

Ekiti, Lagos, Ogun, Ondo, Osun and Oyo. The presence of Lagos State in the zone makes the zone the digital industrial hub of the Country. Moreso, Lagos State alone has the Nation’s highest population of Millennials and would be home to around 20 percent of the Nation’s population aged below 24 years of age by 2025 (Adebule, 2017). A multi-stage sampling procedure was adopted to reach the respondents (Millennial). The first stage involved the purposive selection of the State capitals of the six States in Southwest, Nigeria. These are Abeokuta, Ado-Ekiti, Akure, Ibadan, Ikeja and Osogbo. The second stage involved purposive selection of operators of digitally-based enterprises such as computer-integrated manufacturing, data analytics, machine learning, mobile development, blockchain technology, software development, data engineering, computer network security which are common among Millennials in Nigeria. A snow-ball (chain-referral or network) sampling technique was finally embraced to select 900 Millennial Technopreneurs who were administered. A snow-ball sampling technique was adopted in order for the Millennial Technopreneurs who were found to assist the researcher to recognize and provide contact details of other respondents with similar characteristics/businesses in the study area. The number of respondents selected by State was relative to the number of Millennial Technopreneurs found in each of the States (see Table 1). Both descriptive and inferential statistics were employed for data analysis. The descriptive statistics were frequency counts and percentages; the inferential statistics were regression, correlation and analysis of variance analyses.

4. Results and Discussion

This segment presents the results and discussion of the study. These include the locations of Millennial-Technopreneurs by States in Southwest, Nigeria; knowledge of the Millennial on Innovative Digital Technologies, types of digitally-based enterprises engagements and factors influencing the engagement of the Millennial in digitally-based enterprises.

4.1 Locations of millennial-technopreneurs by states in Southwest Nigeria

Using both purposive and snowball sampling techniques, 900 Millennial-technopreneurs were

sampled in this study. Six hundred and sixteen (68.42%) responded to the research instrument across the state capitals in the 6 States of the Southwest zone (Table 1). About half (48.38%) of the respondents were from Lagos State. This may not be surprising as Lagos State is the industrial hub of the zone and Nigeria at large. Adebule (2017) in Dada (2019) posited that Lagos State has the Nation’s highest population of Millennials and would be home to around 20 percent of the Millennial population of 24 years old and below by 2025 in Nigeria. Moreover, 15.26%, 14.29% and 9.90% of the respondents were located in Ogun, Oyo and Osun States respectively. However, only a few (7.62% and 4.55%) of the respondents were located in Ondo and Ekiti States respectively.

Table 1: Locations of Millennial-Technopreneurs by State

Location by State	Frequency	Percent
Lagos	298	48.38
Ogun	94	15.26
Oyo	88	14.29
Osun	61	9.90
Ondo	47	7.62
Ekiti	28	4.55
Total	616	100

4.2 Knowledge of the millennial on innovative digital technologies

The outcome of this study revealed that the majority (91.67%) of the Millennials claimed to readily possess the knowledge of Innovative Digital Technologies (IDTs) (Figure 2). The knowledge of IDTs offers new thinking with potential to spur innovation, enhance productivity and improve industrial wellbeing of nations (OECD, 2017). There have been indications of the influence of these IDTs on the entrepreneurial disposition of Millennial. The adoption of IDTs such as Robotics, artificial intelligence (AI), sensors and cognitive computing are highly desirable for Nigeria’s industrial resurgence. The ability to create new digital technologies may well lead to development of new products, processes or new industries in response to changing economic environments (Dada, 2020; Dada et al., 2021). However, this largely depends on the ability to access, adapt, utilize, and create digital knowledge

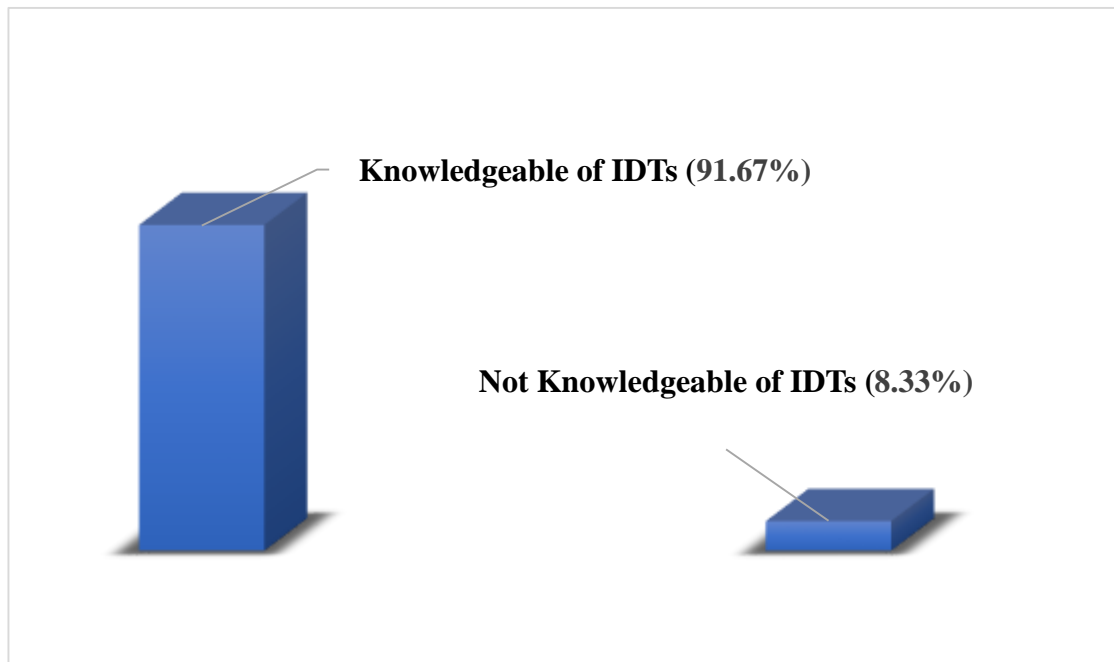


Figure 2: Knowledge of Millennial on Innovative Digital Technologies (N = 616)

and capabilities for industrial competitiveness (Malerba and Nelson, 2011; Dada, 2019). As argued by Brynjolfsson and McAfee (2011) in OECD (2017), the digital transformation of economic activities has unleashed four main innovative trends. These include improvement in real-time measurement of business activities; creation of faster and cheaper business experimentation; widespread and easier sharing of ideas; as well as the ability to replicate innovations with greater speed (scaling-up). However, making the IDTs work among the Millennial will require inclusive, coherent and well-coordinated policies, reflecting a multi-stakeholder approach which provides new job opportunities for firms (OECD, 2017). The application of IDTs in Nigeria will require skills in ICTs to programme software, develop applications and network management. The diffusion of IDTs is changing work done and increasing demand for skill matching such as information processing, self-direction, problem solving and communication.

4.3 Engagement of the millennial in digitally-based enterprises

Among the 616 Millennial who responded to the questionnaire and some that were interviewed, 377 (61.20%) claimed to be engaged in one form

of DBEs (Figure 3). The high proportion of Millennial who were engaged in DBEs was an indication that the Nigerian Youths are becoming conscious of the 4IR.

Naudé (2017) point out that, despite the poor track record of industrialization, there is a renewed desire for re-industrialization in Africa continent driven by technologies such as automation, additive manufacturing and the Industrial Internet. This may have been caused by the high level of awareness on 4IR especially among the younger generation in Africa. According to Schwab (2016), 4IR is driven technologies such as automation, additive manufacturing and the Industrial Internet. Digitally-Based Enterprises (DBEs) are creating new economic opportunities, allowing firms to access new markets as well as bringing new goods and services to consumers globally. DBEs can open opportunities for entrepreneurship, innovation and job creation as well as digital skills that aid SMEs to overcome barriers to their business growths. As opined by European Commission (2017); Urbinati *et al.* (2020), the employment of digital technologies in business enhances digital transformation and eventually the 4IR.

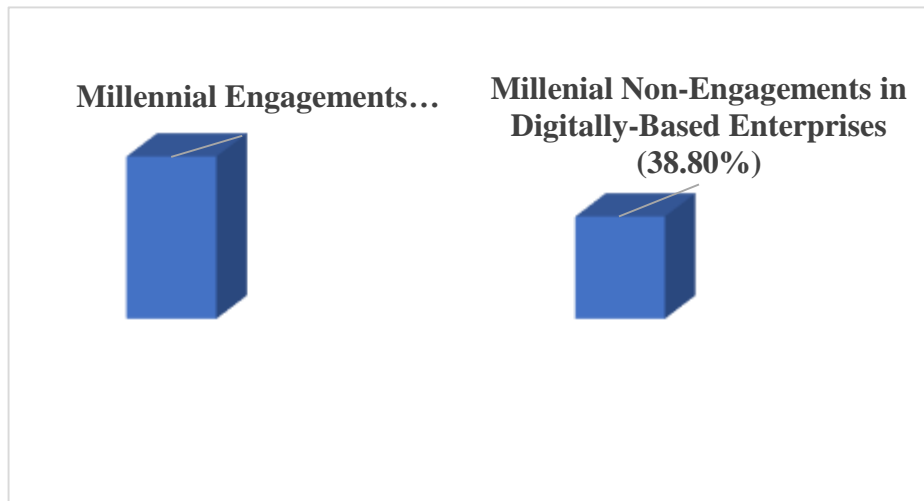


Figure 3: Millennial Engagement in Digitally-Based Enterprises (N = 616)

4.4 Types of digitally-based enterprise engagements of the Millennial

Table 2 depicts the various forms of Digitally-based Enterprises engaged by the Millennial-Technopreneurs in Southwest, Nigeria. These Enterprises include Software Development (32.36%). Software development is a set of computer science activities dedicated to the process of creating, designing, deploying and supporting software. There is a growing importance of Software development increasingly recognized as necessary for digitally based enterprises (DBEs). Moreover, about 17% of the Millennial-Technopreneurs engaged in Data Analytics which is the science of analyzing raw data from where inferences and conclusions about that information are usually inferred. More than 11% of the respondents were engaged in Mobile Development. Mobile Development is the application that creates any kind of software development specific to mobile devices. Mobile applications are usually pre-installed on phones during manufacture and has been gradually growing in revenues and job creation. Over 9% of the Millennial-Technopreneurs claimed to be engaged in Cloud Computing enterprises. Cloud Computing enterprises involve a computing model where businesses can access virtualized Information Technology (IT) resources from public or private cloud service providers on a pay-per-use basis. These resources can include servers, processing power (CPU cores), data storage, virtualisation capabilities and networking infrastructure. Cloud computing enterprises create

new opportunities for businesses to reduce costs while enhancing business resiliency, flexibility and network security. Cloud computing is of growing interest to companies around the globe, but many are finding greater costs and greater obstacles to the adoption of cloud computing than they anticipated (Maricela-Georgiana, 2014). Cloud computing enterprise service providers deliver computing resources to their customers through the Internet. Cloud computing lowers the cost of managing smaller firms that are benefitting from computer-intensive business analytics that are available to large-scale enterprises. They may also provide software cloud management systems or managed services to help their customers maximize the benefits of the cloud. Enterprises are also pursuing multi-cloud computing strategies to maintain flexibility, drive innovation and reduce their dependence on any one public cloud service provider. Furthermore, 7.69% of the respondents were involved in data engineering. Data engineering is the aspect of data science that focuses on practical applications of data collection and analysis (Black, 2020).

Only 6.89% of the Millennial–Technopreneurs were involved in financial technology (Fintech) enterprises. This is used to describe new technologies that seek to improve and automate the use and delivery of financial services. Fintech is a blended business technology that uses technology to enhance or automate financial services and processes (Van Loo, 2018). Fintech enterprises incorporate several digital technologies such as

artificial intelligence, data science and blockchain into traditional financial practices for faster, safer and more efficient financial operations. Fintech is one of the fastest-growing technology sectors in the world, with companies innovating in almost every area of finance, from payments and loans to credit and stock trading. Fintech innovation also includes the development and use of cryptocurrencies, *digital cash and blockchain technology* (Schüffel, 2016). Other involvement of Millennials in DBEs are Machine Learning (5.57%), Blockchain technology (3.71%), Cyber security (3.45%), Internet-of-things (IoT) (1.86%) and Visualisation (1.33%). These Enterprises are majorly the building blocks of the fourth industrial revolution. Other specified digitally-based Enterprises are Cryptocurrency, Digital Marketing, autoCAD design, Deep learning, Python

Programming, Data Security, Design Thinking Development and 3D Printing.

4.5. Factors influencing millennials' engagement in digitally-based enterprises

The factors that influenced the engagement of the Millennial-Entrepreneurs in Digitally-based Enterprises (DBEs) in Southwest, Nigeria is discussed in this section of the paper. Table 3 revealed that Entrepreneurial alertness was found to be the major (76.90%) factor responsible for the engagement of the Millennials in DBEs. Similar findings by Dada (2020) revealed that 83.4% of Millennials in the Federal University of Technology, Akure, Nigeria located in Southwest, Nigeria had high Entrepreneurial alertness. According to Kirzner (1979), entrepreneurial alertness is an individual's ability to identify opportunities which are overlooked by others.

Table 3: Factors Influencing the Engagement of Millennial Entrepreneurs in Digitally-Based Enterprises (n = 313)

Factor***	Percent
Entrepreneurial alertness	76.90
Personal Exploits	68.67
Business Innovation Competitions/Innovation Challenges Programme	66.53
Seminar and Workshop Attendance	61.80
Enterprise Innovation Foundations (Hult price Foundation, Hackahton, Tony Elumelu)	57.48
Entrepreneurship Mentorship Programme	54.59
Skill Acquisition/Entrepreneurship Development Programmes	46.73
Industrial Work Experience	39.26
Entrepreneurship Education	36.91

*** Multiple Responses

When the entrepreneurial alertness and DBEs of the youths is enhanced, there is development of new products, processes or new industries leading to 4IR and sustainable development of economies.

As indicated by the respondents, other factors that contribute to the Millennial-Technopreneurs' engagement in DBEs are personal exploits (68.27%), business innovation competitions/innovation challenges programme (66.53%) as well as seminar and workshop attendance (61.80). Furthermore, enterprise innovation foundations such as Hult price,

Hackahton, and Tony Elumelu (57.48%), entrepreneurship mentorship programmes skill

acquisition/ entrepreneurship development programmes (54.59%); and industrial work experience (46.73%) were other factors that influenced the engagement of the Millennial in DBEs in Southwest, Nigeria. Without essential enterprise-based knowledge, new firms may drift away from the dynamics of the market and lack the proper background to control its business. Implementation of industrial work experience programmes in Nigerian higher institutions is aimed at empowering the adult youths practically in relation to their professional course to impart on the job market after graduation. The impact of entrepreneurship and students' industrial work experience has been cause of concern to education and economic planners particularly with respect to graduate employment.

The study further reveals that the influence of entrepreneurship education on the engagement in DBEs of the Millennial Entrepreneurs was 39.26%. According to Wang and Wang (2004), Dada (2019) and Boldureanu *et al.* (2020), entrepreneurship education has positive correlation with entrepreneurial interest of young adults. Entrepreneurship education is a collection of formalized teaching that informs and trains individuals who are interested in business creation or small business development that equip entrepreneurs with entrepreneurial skills (Adeola and Bolarinwa, 2010; Siyanbola, 2012, 2013; Uzo-Okonkwo, 2013). The education offers requisite skills and knowledge for entrepreneurial proclivity of the youth. The accumulation of evidence suggests that knowledge and skills learned in school can transfer to entrepreneurial and innovative conduct especially among young people (Bransford *et al.*, 2000; Barbot *et al.*, 2016).

4.6 Effect of Factors that Influence Millennial Engagements in Digitally-Based Enterprise

The effect of factors that influence the engagements of Millennial in Digitally-Based Enterprises (DBEs) is shown in the linear regression equation.

$$Y = 2.803 + 0.826X_1^{**} + 0.412X_2^{**} + 0.639X_3^* + 0.452X_4^* + 0.431X_5^{**} + 0.330X_6^* + 0.5067 + 0.206X_8 + 0.534X_9^{**}$$

(0.213) (0.109) (0.040) (0.431) (0.327)
 (0.064) (0.195) (0.490) (0.371)

R² value = 0.74

Values in parentheses are standard errors

**Significant at 99 percent confidence level (p ≤ 0.01)

*Significant at 95 percent confidence level (p ≤ 0.05)

The analysis of the effect of the factors that influence the engagement of Millennials in DBEs showed that seven factors significantly influence

their engagement. These factors are Entrepreneurial Alertness, EA (β = 0.826, p≤0.01), Personal Exploits, PEs (β = 0.412, p≤0.01), Business Innovation Competitions/Innovation Challenge Programmes, BICICIP (β = 0.639, p≤0.05), Seminar and Workshop Attendance, SWA (β = 0.452, p≤0.05), Enterprise Innovation Foundations, EIF (β = 0.431, p≤0.01) and Entrepreneurship Mentorship Programmes, EMP (β = 0.330, p≤0.05), EE (β = 0.534, p≤0.01). These factors all contributed 74.1% (R² value of 0.741) to the DBE Engagements of the Millennial. The R² value of 0.741 indicated that 74.1% of the variation in DBE Engagement of the Millennial is explained by variation in the factors of the Millennial-Technopreneurs. As shown in Table 5, the R² value conveys on how well the regression line fits the data as an indicator of predictive accuracy of the regression line.

Narratives of Variables

Dependent Variable

Y₀ = Engagements in Digitally-Based Enterprise of the Millennial (EDBEM)

Independent Variables (X_i)

X₁ = Entrepreneurial Alertness (EA)

X₂ = Personal Exploits (PEs)

X₃ = Business Innovation Competitions/Innovation Challenges Programme (BICICIP)

X₄ = Seminar and Workshop Attendance (SWA)

X₅ = Enterprise Innovation Foundations (EIF)

X₆ = Entrepreneurship Mentorship Programme (EMP)

X₇ = Skill Acquisition/Entrepreneurship Development Programmes (SAEDP)

X₈ = Industrial Work Experience (IWE)

X₉ = Entrepreneurship Education (EE)

Table 5: Model Summary of Regression Analysis of the Engagements of Millennial in Digitally-Based Enterprise in Southwest, Nigeria

R ²	Adjusted R ²	Std. Error of the Estimate	Change Statistics		
			R ² Change	F Change	Sig. F Change
0.740	0.597	0.261	0.597	5.138	0.000

Table 6: ANOVA Model

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	0.608	1	0.608	1.476	0.003
Residual	155.088	376	0.412		
Total	155.696	377			

The overall outcome of the analyses implies that the Millennials' engagement in DBEs depends to a large extent, on their knowledge of Innovative Digital Technologies (IDTs). The model is significant and therefore, good for prediction of the 4IR in Nigeria. Moreover, the Analysis of Variance (ANOVA) test revealed statistical significance ($F=1.476$, $p \leq 0.01$) of the knowledge of innovative digital technologies of the Millennial on their Digitally-based Enterprise engagements (Table 6). The outcome of the analysis has implications for the 4IR in Nigeria.

5. Conclusion and Policy Recommendations

This paper touches on relevant issues concerning the influence of Innovative Digital Technologies (IDTs) of the Millennial on the 4IR Nigeria. The study shows that the knowledge of IDTs Digitally-Based Enterprises (DBEs) behaviors of the Nigerian Millennial is relatively high with potentials for 4IR in Nigeria. The pace of IDTs on the 4IR indicates that digital disruption will continue to evolve quickly, introducing changes to the structure of the Nigerian industrial space. To deepen Millennial engagements in DBEs, this paper recommends that more support and encouragement should be given to the Millennial for exploitation of entrepreneurial opportunities as well as sustainable industrial growth and development in Nigeria.

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