Chapter Six

Theoretical and Conceptual Framework for Digital Inclusion among Mathematics Education Students in Nigeria

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Abstract
The term digital inclusion has been used to articulate the policy, research and practical efforts to look beyond issues of access to computers and the Internet and toward a more robust understanding of the skills, content and services needed to support individuals, families and communities in their abilities to truly adopt computers and the internet. Presently, the deep penetration of digital technologies into the fabric of society have boosted growth, expand opportunities and improved service delivery, resulting in a high level of connectivity between people, businesses and governments. This present review examines the theoretical and conceptual foundations of digital inclusion in light of developmental realities in Nigeria. Specifically, this review considers the framework for inquiry into the technological divide, the new psychological model of e-adoption within the context of the digital divide, the three-step path to engaging with the internet, and a model of digital literacy. The review also considers key conceptual definitions of digital inclusion, the stages of digital inclusion, and approaches to measuring digital inclusion. The implication of digital inclusion for mathematics education students and the Nigerian economy was also discussed.

Introduction
Nigerians are increasingly becoming technology enthusiasts. Statistics available at the Nigerian Communications Commission (NCC) as at February 2018 put the number of phone subscribers in the country at over 149 million, with a high percentage of users accessing information via smart phones and other handheld devices (Nigeria Communications Commission - NCC, 2018). Twinpine Network (2017) report that Nigeria was the most mobilized country in the world, ahead of India and South Africa, with 40% mobile penetration and 30% smart phone penetration rate. Nigerians spend an average of 193 minutes on smart phones daily across all media, the Twin

pine Network report added. This category of users comprises young adults, mostly undergraduates of Nigerian higher educational institutions, including students of mathematics education.

The amazing level of digital penetration in Nigeria, however does not imply that mathematics education students as digital natives are fully deriving optimum educational, economic and social benefits from digital technologies. This is because each societal system interprets digital literacy according to the inner structures and imperatives in differential discourses, with the connotations of digital literacy in economy differing from those in the educational system. While the economy stresses the importance of digital literacy as a factor of production and urges to close IT- skills gaps which could reduce productivity, the educational discourse points out dimensions of digital literacy which are beyond the pure instrumental usage of IT (Gapski, 2007). For mathematics education students, this comprises personal evolvement by creating digital expressions, self-reflexive and ethical dimensions of digital literacy. Thus, the ability of these students to achieve effective and sustainable processes of empowerment may be what matters ultimately.

While access remains a primordial condition for the use of ICTs, once barriers of access are diminished, inequalities regarding skills, and usage patterns remain (Marien & Prodnik, 2014). In the end, poor and rich alike might have access to the Internet as obtainable on a campus-wide cloud network (Iji, Abah & Anyor, 2018), but only a privileged few are able to turn to the internet as an asset, a lifestyle and an incentive (Witte & Mannon, in Marien & Prodnik, 2014). Differences in skills, attitude and support networks lead to segmented usage patterns and substantial discrepancies in the ability of students to develop capital-enhancing usage patterns. The impressive numbers from statistics on ICT penetration can create an illusion that, by having access to digital technologies, people automatically know how to use them. People tend to assume that if they own a digital device and know how to use certain applications, then they already have all the necessary skills for personal and professional life (ECDL Foundation, 2016). However, surveys conducted in some countries considered to be digitally advanced revealed that gaps exist between self-perceived and actual levels of digital skills. Even young people, who are falsely assumed to be “digital natives”, usually under perform in practical tests (ECDL Foundation, 2016).

This review first considers the theoretical framework for understanding digital inclusion. This is followed by an exposition on the core concepts of digital inclusion. The review concludes with a broad view of existing national framework for digital inclusion in Nigeria.

Theoretical Framework

Years of research into the existence of digital divide, digital exclusion, digital literacy and digital inclusion has thrown up certain identifiable thought patterns, explanations and conjectures. These articulations that have enjoyed considerable consistency in the body of available literature may be adjudged as appropriate theoretical foundations and reference point for studies in digital inclusion. The few mentioned in the present study may not be exclusively all that there is in this field of research, but are randomly considered based on relatedness to the context of this study.

Although the individual consequences of digital exclusion may vary depending on personal, regional, cultural factors and the like, the Framework for Inquiry into the Technological Divide (West & Heath, 2009) provides a versatile and comprehensive theoretical framework applicable to various populations at both local and international locations. The framework is divided into three sections, namely fifocal vision, technological divide framework and outcomes and process (Figure 1).

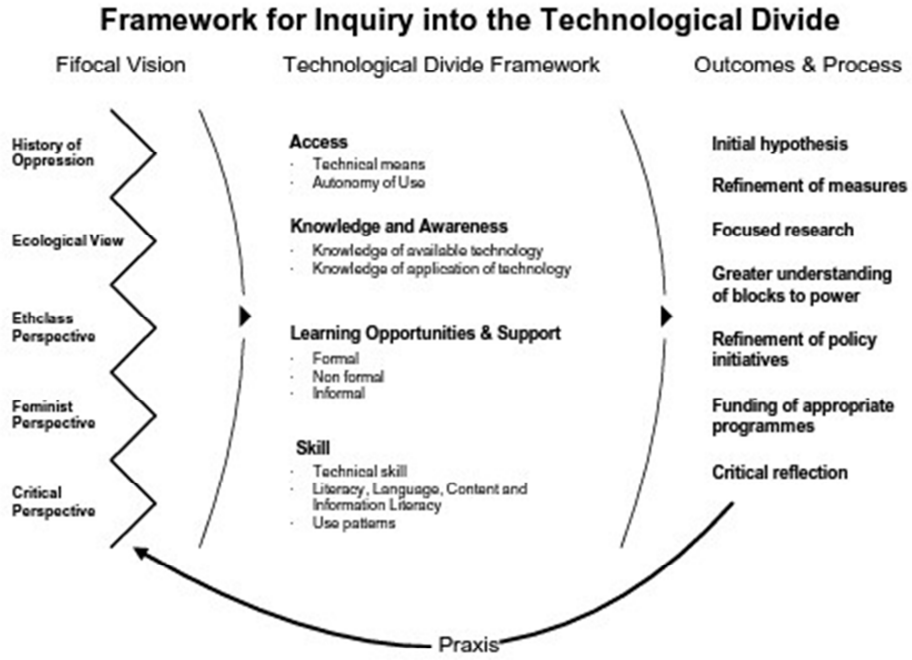

Figure 1: The Framework for Inquiry into the Technological Divide (*Source: West & Heath, 2009*)

"Fifocal vision" represents a critical analysis mechanism that performs two vital functions. Firstly, it places the technological divide in the socially constructed context and secondly, it helps to locate potential areas for social interventions that address digital exclusion and remove blocks to power. In this sense, the lenses of fifocal vision can be applied by studies like the present one to critically analyze power imbalances experienced by specific populations (students of mathematics education) in their specific location and practice context. The "technological divide framework" represents measurable concepts that allow disparities in technological utilization to be universally researched and compared between and within groups (West & Heath, 2009). Each factor in this column influences the ability of mathematics education students to fully utilize the capabilities of technology. West and Heath (2009) assert that these factors viewed collectively, reflect how theorists have evolved notions of digital exclusion from initial conceptualizations based principally on access. The right hand column entitled "outcomes & process" represents the practical application of the framework in the context of the broader goal to globally improve the social justice outcomes associated with digital exclusion. This translates into a sustained, long term process of identifying and intervening to close gaps in the technological access,

knowledge, awareness, learning opportunities, support and skills of different people and groups (West & Heath, 2009). A noticeable feature of this final column is the conceptualization of research, policy, practice and critical evaluation as a process to ameliorate a technological divide. The praxis arrow at the foot of the framework highlights the spiraling nature of the model, linking intrinsically to the requirement to build on existing knowledge and address digital exclusion via an integrated and collaborative approach.

Building on the framework of several technology-adoption models, Thatcher (2011) provides a new Psychological Model of e-Adoption in the context of the Digital Divide (Figure 2).

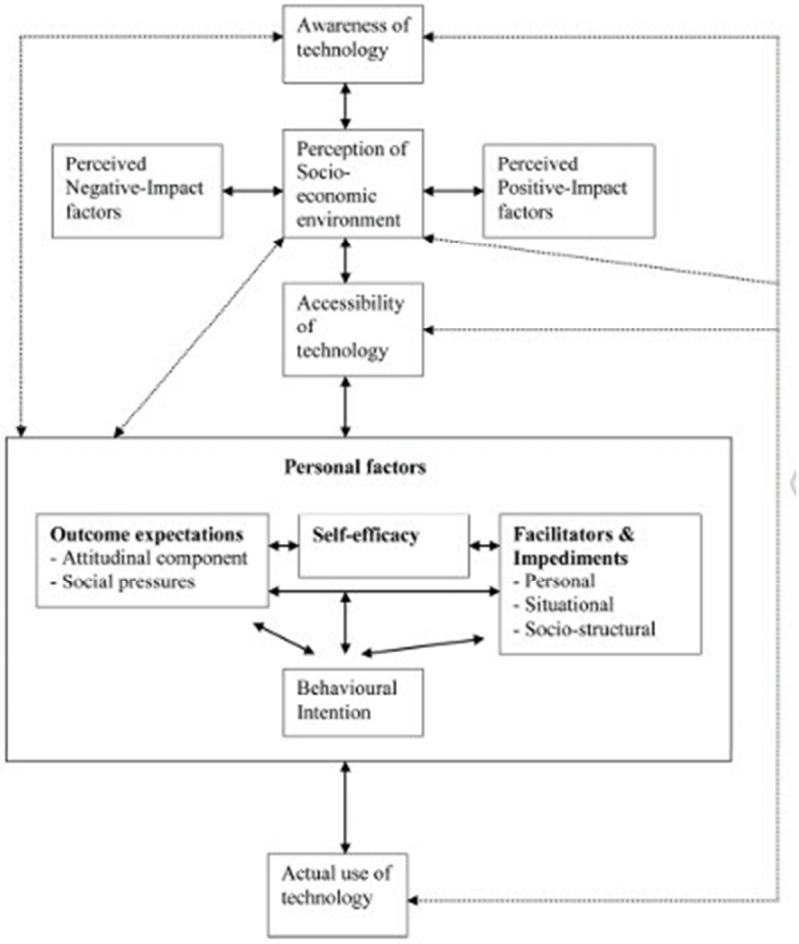

Figure 2: New Psychological Model of e-Adoption within the context of the Digital Divide (*Source: Thatcher, 2011*).

The logical starting point in the Model is the awareness that a technology exist and the awareness that the specific technology may have some positive impact on socio-economic upliftment. Similarly, Thatcher (2011) acknowledges that one's perceptions of the socio-economic environment are influenced by positive-impact and negative-impact factors. While positive-impact factors include favourable perceptions towards technological infrastructure, employment levels, and education and training systems;

negative-impact factors include pessimistic perceptions such as poverty, corruption, bribery and access to basic resources. This model proposes feedback mechanisms with the awareness concept. Highly negative-impact perceptions of the socio-economic environment will force people to concentrate on meeting basic psychological needs (i.e. sourcing and/or maintaining water, food and shelter). Highly positive-impact perceptions will leave cognitive space for people to explore new technological territory. Thatcher (2011) explains that reciprocal relationships exist between social pressures and perceptions of the socio-economic environment as well as determining which technology is available within a particular social context. Significant others for students may include friends, peers, supervisors, society leaders, opinion leaders and pressure groups. The influence of media, advertising and other social networking processes are important social pressures, depending on the social context of the technology. The broad submission of the model is that the obvious intended outcome in addressing the digital divide would be actual technology usage behaviour, which is not a simple dichotomy (i.e. use or non-used) but also incorporate aspects such as quantity of the usage, the extent of the usage and the quality of the usage (e.g. does it actually bring about the socio-economic upliftment effects) (Thatcher, 2011).

Surman, Gardner and Ascher (2014) arrive at a conceptualization of the 3- step Path to Engaging with the Internet by pondering on some key questions including:

> *But now is the time to ask, what kind of internet do we need to build to unlock these social and economic opportunities for people in emerging market? Even if we solve key issues like access, affordability and efficiency, what will the next billion internet users find when they get online? Will it interest them? Will it improve their lives? Will they be able to shape the internet to ensure that it does?* (p.57)

In considering these pertinent concerns, Surman *et al.* (2014) posit that engaging with the Internet entails three (3) major components, namely exploring, building and participating (Figure 3).

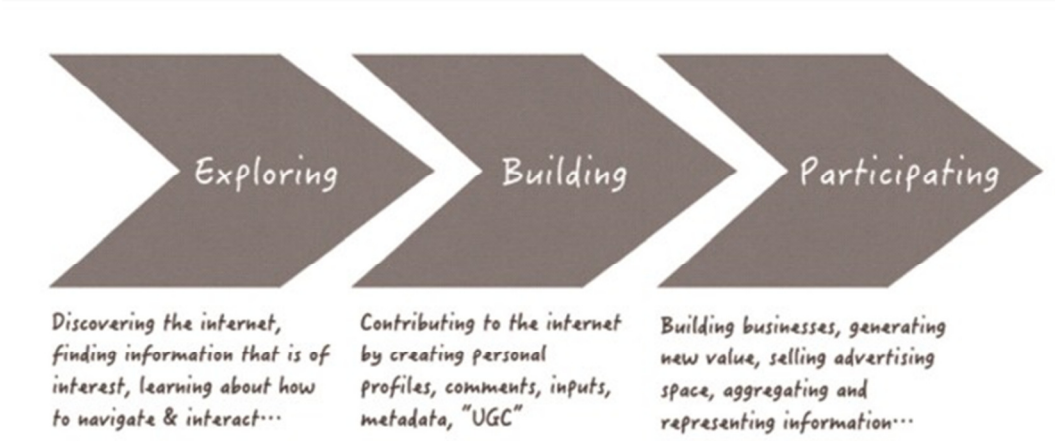

Figure 3: The 3 – step path to Engaging with the Internet (*Source: Surman et al., 2014*)

The thrust of the work of Surman *et al.* (2014) is that a considerable amount of effort is needed to develop ways to massively improve the digital literacy of people coming online for the first time. By actively moving people through the stages of exploring, building and participating, mobile users can be turned into engaged, empowered internet citizens who are able to both find and create value on the internet. Such effect must start with understanding the mobile internet and what it can do, then, leads seamlessly to creating content and successfully running a business-and a life- online. This amounts to a great deal of human capital development, particularly, if the young students of mathematics education are lead through such effort, directly or indirectly. The skills in question are not skills that only programmers need; they are skills that everyone needs to take part in a digital life and create local digital economies (Surman *et al.*, 2014). What is needed is a broad platform to find a way to get these skills to everyone, including shopkeepers, farmers and all kinds of creators from every part of the country. A good digital literacy platform should begin by imbibing skills needed in exploring (navigating the web), building (creating for the web) and connecting (participating on the web).

Similarly, Murray and Perez (2014) propose a Model of Digital Literacy in which knowledge, skills and attitudes coalescence in the context of reflective self-awareness and purposeful intent to allow a computer user to achieve generativity. In this model, generativity is the ability to generate new skills and knowledge that form the basis for creativity (Figure 4).

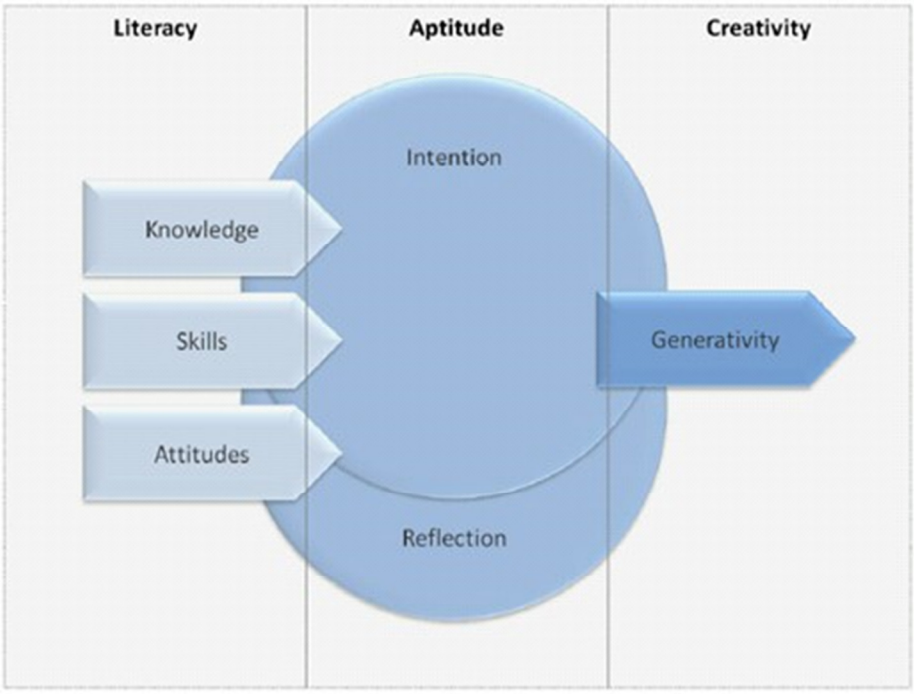

Figure 4: A Model of Digital Literacy (*Source: Murray & Perez, 2014*)

The dimensions of literacy, aptitude and creativity are overlaid on the model to illustrate movement from foundational to self-aware to innovative interactions with computer technologies. Literacy encompasses knowledge, skills and attitudes; aptitude captures reflection and intentions; generality connotes the potential for creativity. Although the model shows movement from literacy to aptitude to creativity, there is no linearity in the relationships among these complex constructs (Murray & Perez, 2014). The overlay of literacy, aptitude and creativity is meant to give meaning to the complex, interactive processes by which users learn about, interact with, assimilate and transfer information technology artifacts and concepts – processes that are neither linear nor deterministic (Murray & Perez, 2014). This model clearly goes beyond functional literacy to encompass problem-solving, creativity and generativity. Murray and Perez (2010) stress that this presents a complex, but not novel, challenge for institutions of higher education, wherein a similar process played out-vis-à-vis the evolution of the fundamental literacies of reading, writing and arithmetic. A key concept of the model, therefore, is that digital literacy must be taught. Many students entering the university today have a high level of exposure to digital technologies and media, but Murray and Perez (2014) note that they are, however, not prepared to cross the bridge between personal and academic use of technology. The bottom-line of this model is the emphasis that as academic knowhow is gained through formal education, so too must technological prowess be gained through structured learning experience.

Conceptual Framework

Defining Digital Inclusion

Reder (2015) reports that one widely used definition which appeared in the Building Digitally Inclusive Community Framework states that:

> *Digital inclusion is the ability of individuals and groups to access information and communication technologies. Digital inclusion encompasses not only access to Internet but also the availability of hardware and software; relevant content and services; and training for the digital literacy skills required for effective use of information and communication technologies. (Reder, 2015, p.4)*

In the same vein, the Federal Communications Commission – FCC (2017) adopts the definitions provided by the National Digital Inclusion Alliance which defines digital inclusion as:

> *The activities necessary to ensure that all individuals and communities, including the most disadvantaged, have access to and use Information and Communication Technology (ICT). This includes five elements: 1) affordable, robust broadband internet service; 2) internet-enabled devices that meets the needs of the users; 3) access to digital literacy training; 4) quality technical support; and 5) applications and online content designed to enable and encourage self-sufficiency, participation and collaboration. (FCC, 2017 p.3)*

It is also worthy to note that the context of these definitions implies that digital inclusion must evolve as technology advances and recognizes that access to and use

of ICTs is an essential element for participation in society, democracy and economy. The context also establishes that digital equity is the ultimate outcome of full digital inclusion, with focused action and investments to eliminate historical, systematic and structural barriers that perpetuate disadvantaged individuals and communities (FCC, 2017). Digital equity recognizes the moral obligation to harness ICT to address the needs of disadvantaged individuals, communities, neighbourhoods, community-based organizations and small businesses.

Gradually, the notion of digital inclusion has come to the fore in policy and research and, moreover, was conceptualized beyond the mere provision of access. Instead, digital inclusion is seen as the process through which direct barriers to ICTs (e.g. access, motivation, support, digital skills) are brought down and through which individuals are enabled to regain a sense of power in their life, and increase their ability to participate in various life domains (e.g. employment, education, culture and politics) (Marien & Prodnik, 2014). Attention has shifted towards the need for an active consumption of ICTs, instead of the mere consumption of content, a move from being a novice user to a digital innovator (Iji & Abah, 2019).

Stages of Digital Inclusion

In emphasizing the existing trend, Reder (2015) explains that there are four stages in the Digital Inclusion Pathway. Individuals who have never used a computer are in the first stage, termed Digital Access. Individuals who have used computers are in the second stage called Digital Taste, in which they decide whether they want to use a computer for a particular purpose. “Taste” is used here as the sociological concept of an individual’s personal and cultural patterns of preference and choice in ways of doing things (Reder, 2015). Individuals who have used computers and have taste for using them for certain tasks may lack the basic ICT skills needed to effectively use the technology for the particular task. Those lacking the basic technology skills are in the third or Digital Readiness stage, not yet “ready” to use the technology. Individuals who have used computers and have taste and readiness for using them are in the final stage, called the Digital Literacy stage, in which they systematically develop their uses of ICT and proficiency in solving problems with it. In the illustration provided by Reder (2015) (see Figure 5), each stage has its own barrier that must be overcome to move forward in the pathway.

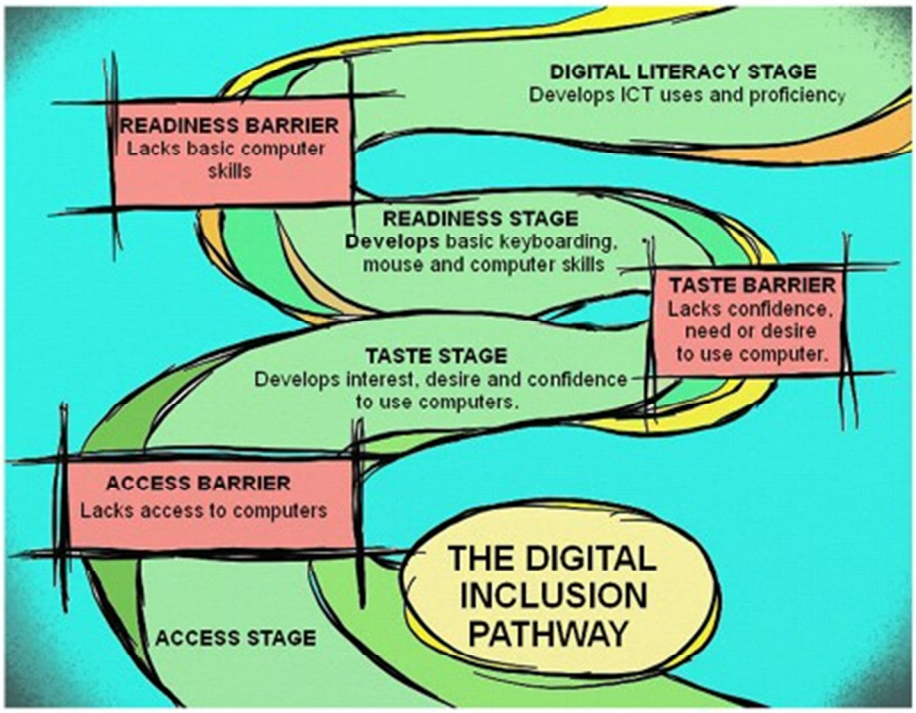

Figure 5: The Digital Inclusion Pathway (*Source: Reder, 2015*)

Measuring Digital Inclusion

It is obvious from all emphasis hitherto that skills are the determinants of digital inclusion. Technology is changing rapidly and therefore digital inclusion is also dynamic, that is, what was considered advanced three years ago can be considered "basic" digital inclusion now. This means that the categories and measurement framework for digital engagement need to stand the test of time and be able to deal with these changes (Helsper, 2008). For instance UK Online Centres (2007) reports that the Digital Inclusion Panel (DIP) in 2004 created a model to measure digital inclusion on two axes, namely Access and Engagement. Access is conceived as including the use of internet via computer, mobile phone and digital television while Engagement is conceived as combining both motivation (whether people are using these technologies or not) and the level of sophistication of their use (UK Online Centres, 2007). Table 1 shows the Panel's definition of the measurement levels of the two axes.

Table 1: Measurement level of Access and Engagement (*Source: UK Online Centres, 2007*)

Access		Engagement	
Level	**Definition**	**Level**	**Definition**
Very High	Access to internet at home as well as access to a computer, mobile phone and digital television	Unengaged	Have never been digitally engaged, or have not been engaged in the last three months
High	Access to internet at home as well as to at least one of a computer, mobile phone and digital television	Digital communication	Digitally engaged to communicate in new ways (e.g. text messages or e-mail
Moderate	Internet access in communal facilities only, not at home. Home access to at least one of a computer, mobile phone and digital television	Digital Harvesters	Digitally engaged and use interactive content, as well as communicating in new ways.
Low	Internet access at communal facilities only, not at home. No home access to a computer, mobile phone and digital television	Digital Transactors	Digitally engaged to transact as well as using interactive content and communicating in new ways.

In contrast to the foregoing measurement approach, Helsper (2008) considers aggregate measures that are formed from lower level indicators (e.g. quality and location of access), providing four categories that are contextual in a similar way to the categories of social exclusion.

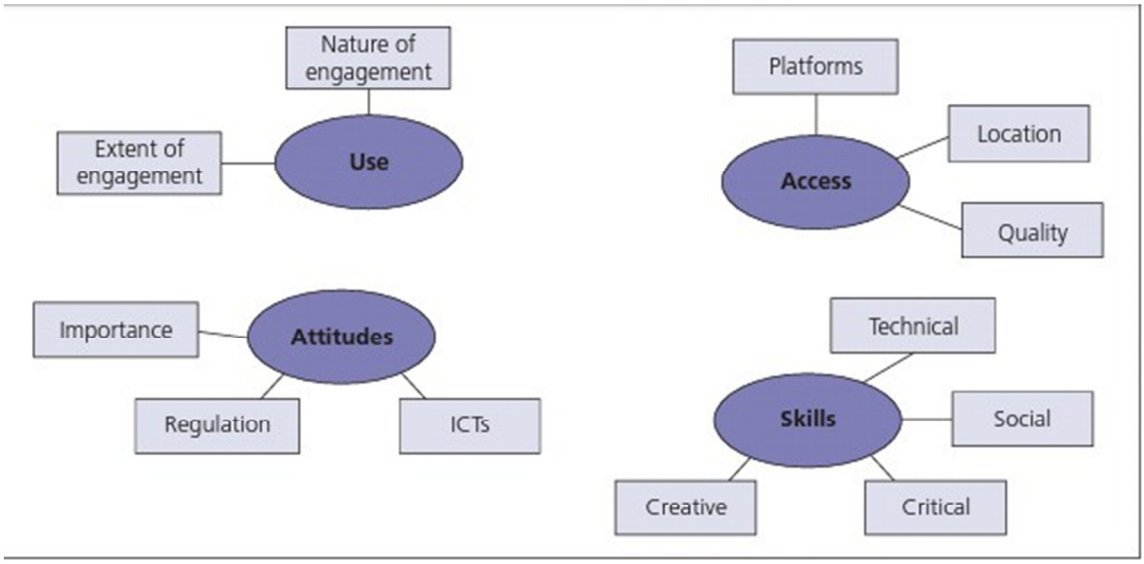

Figure 6: Aggregate Measures for the Four Categories (*Source: Helsper, 2008*)

As shown in Figure 6, for each of the four categories (use, access, skills and attitude) a separate scale can be constructed and used for comparative analyses. This framework and measurement approach provides a robust basis for an ideal measure of multiple digital deprivations, in contrast to other indices of digital exclusion which focus mainly on "access" deprivation (Helsper, 2008).

A more encompassing measurement framework is the Australian Digital Inclusion Index (ADII) (Thomas *et al.*, 2016). To determine the degree of overall digital inclusion in Australia, the research team measured people's level of access to the internet, along with related products, services, expenditure, activities, attitudes and skills. The ADII is made up of three sub-indices or dimensions: Access, Affordability, and Digital Ability. Each sub-index is made up of a number of components, which have themselves been calculated from numerous variables. Variables come in two levels: "headline variables" are thematic composites of "underlying variables" (individual survey questions), and are generally calculated as simple averages (Thomas *et al.*, 2016).

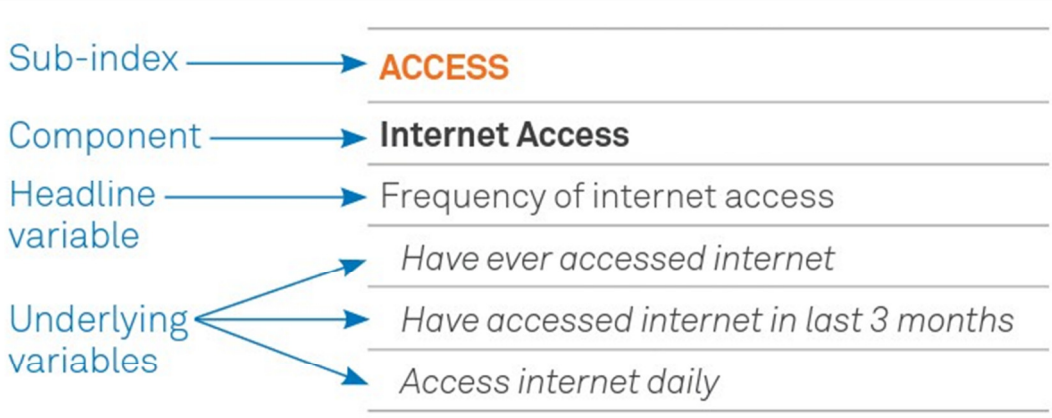

Figure 7: Cross section of a sub-Index of ADII (*Source Thomas et al., 2008*)

In the ADII framework, the Access sub-index consists of three components, namely Internet Access (measured by frequency of access, places of access and the number of access points); Internet Technology (including variables related to computers, mobile phones, mobile broadband and fixed broad band); and Internet data (Thomas *et al.*, 2016). Affordability is made up of two components: Relative Expenditure and Value of Data. Digital Ability captures both the confidence with which people use the Internet and associated technologies, and the extent to which they are integrated into their lives. Digital Ability sub-index consists of three components namely, Attitudes (measured by responses to five survey questions related to notions, of control, enthusiasm, learning and confidence); basic skills (consisting of six categories: basic, mobile phone, banking, shopping, community and information skills); and activities (accessing contents, communication, transactions, commerce, media and information) (Thomas *et al.*, 2016).

The Nigerian Context

Rebasing of the Nigerian economy in 2014 gave appropriate weight to job creating parts of the economy, such as banking, the Nollywood film industry and ICT that have been growing fast in recent years. The ICT sector contributing 9.61% to GDP (in 2014) – over $50 Billion – has become a pillar of the Nigerian economy and its fastest growing sector (National Information Technology Development Agency – NITDA, 2016). ICT presently facilitates the creation of a more diversified economy through significant impact and strategic addition of value to other sectors of the economy. Initiatives adding value through ICT have created jobs and boosted innovation in Nigeria. NITDA (2016) reports that Nigeria's ICT sector has attracted over USD 6 Billion in Foreign Direct Investment (FDI) and has continued to drive inclusive and sustainable national growth and development. The recent visits to Nigeria by chief executives of global technology giants like Google, Facebook and Microsoft attests to the potential wealth the growing levels of digital inclusion in the country holds.

Considering the fact that ICT is critical to developing an inclusive and prosperous knowledge economy, the NITDA has been saddled with the responsibility of spearheading the ICT for Development (ICT4D) Strategic Action Plan. The National Strategic ICT4D Plan was developed through a multi-stakeholder process involving the participation and contribution of all sectors of the economy and society (Figure 8).

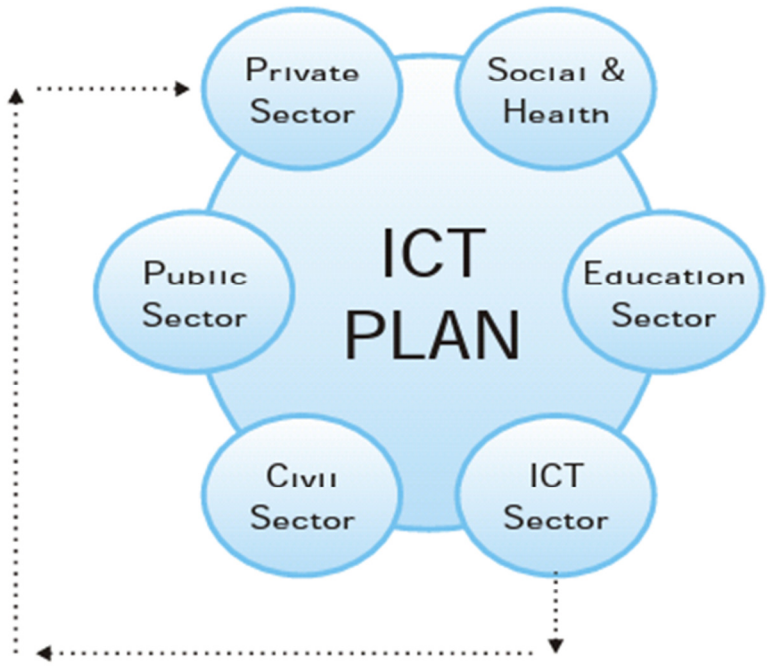

Figure 8: Nigeria's Strategic ICT4D Plan (*Source: NITDA, 2016*)

The plan is targeted at making Nigeria one of the top 20 economies in the world by Year 2020 (Figure 9).

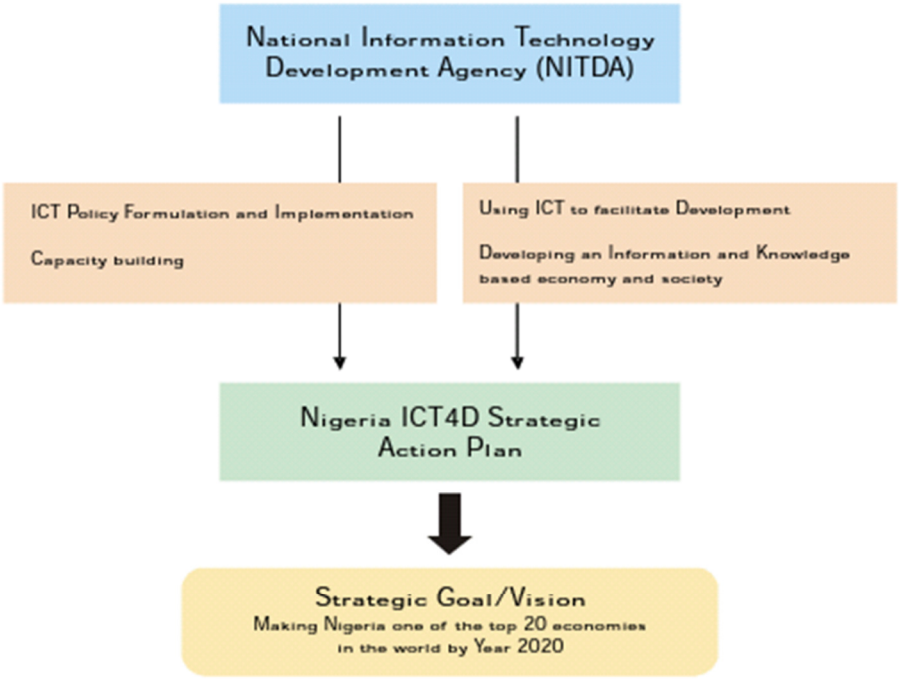

Figure 9: Background of Nigeria's Strategic ICT4D Plan (*Source: NITDA, 2016*)

The plan consists of 11 sub-plans representing the 11 pillars of the Plan as shown in Figure 10.

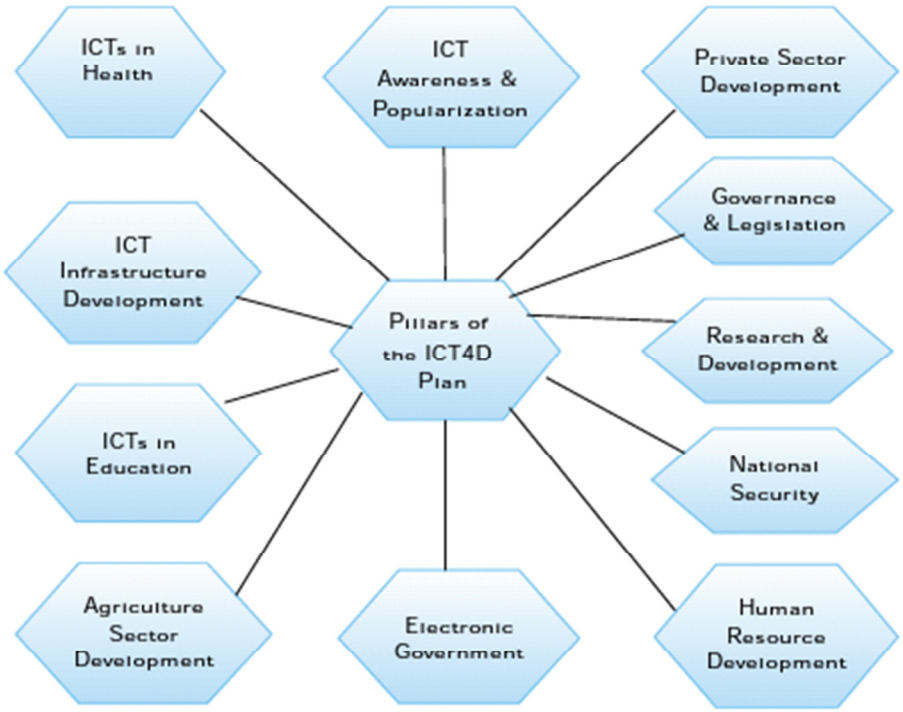

Figure 10: Pillars of the ICT4D Plan (*Source: NITDA, 2016*)

As observed from Figures 8 to 10, education is an essential tool for achieving sustainability within the Nigerian ICT sector. In this sense, Education for Sustainable Development (ESD) entails giving people knowledge and digital skills for lifelong learning to help them find new solutions to their environment, economic, and social issues (McKeown, 2002). Such educating for a more sustainable future in its broadest sense includes improving quality basic education, reorienting education to address sustainability, improving public awareness, and providing training to many sectors of the society (UNESCO, 2005). Within this perspective, the mathematics education students considered in this study are trainee-teachers whose skills and intellectual development will have immeasurable ripple effect spreading across diverse sector of the Nigerian economy. Evidently, the role of institutions of teacher education in impacting digital skills to address sustainability is a pivotal one. To begin with, these institutions have the responsibility and potential to bring changes within educational systems that will shape the knowledge and skills of future generations. Through the provision of amiable atmosphere for better digital inclusion, teacher-education institutions, such as the one involved in this present study, serve as key change agents in transforming education and society, making possible a more sustainable future (UNESCO, 2005).

Not only do teacher-education institutions educate new teachers, they update the technological knowledge and digital skills of in-service teachers, create teacher-education curriculum, provide professional development for practicing teachers,

contribute to textbooks, consult with local schools, and often provide expert opinion to regional and national ministries of education (UNESCO, 2005). One of the areas that require improvement in the service delivery efforts of universities is the training of software developers to close the gap created by shortage of experts in web design and programming. Likewise, as recommended by Iji, Abah and Anyor (2017), the ICT directorates of public universities must wake up to the challenge of epileptic internet service delivery by building a consistent maintenance culture to sustain efficient cloud service delivery system. More access points are to be made available everywhere on campus, even around students' hostels to support efficient mobile learning.

Iji and Abah (2019) reveal verifiable empirical evidences that indicate that the investment growth effect of ICT on the productivity of Nigeria is positive and significant. This implies a necessity of a higher level of human capital for a significant ICT impact on labour productivity (Lovric, 2012). Human capital comprises a set of factors such as education, experience, training, intelligence, energy, work habits, trustworthiness, and initiative that affect the value of a worker's marginal product (Frank & Bernanke, 2007). As seen throughout Iji and Abah (2019), time investment in education by students and investment in education by government stand to contribute to human capital development (Shuaibu & Oladayo, 2016). The ICT infrastructure put on ground by higher educational institutions in Nigeria provides ample opportunity for students and graduates to partake in various economic activities that are important components of societal development, and contributes immensely to the living standard of people (Iji & Abah, 2017). Shuaibu and Oladayo (2016) maintain that Nigeria should continually seek to improve institutions, promote good governance, increase output and provide adequate technological infrastructure in order to sustain human capital development efforts. Such call is imperative since regions of higher level of investment, particularly in higher education, tend to have larger concentration of ICT sector firms, including provision of ICT services and manufacture of ICT devices and equipment (Izushi & Huggins, 2004). In addition, there is a clear indication that the level of human capital in an economy advances with the growth in the vital role ICT plays in enabling human capital development (Oluwatobi, Olurinola & Taiwo, 2016).

The status of digital inclusion among mathematics education students suggests that students can develop the spirit of entrepreneurship and become gainfully self-employed in different areas of the ICT sector. Ayoola-Ainjobi and Akinseye (2016) assert that such entrepreneurial engagements, even while in school, are able to put food on students' tables, meet their basic needs, and drastically reduce poverty level in the country. Web design and hosting, creating applications, and provision of other knowledge-based services by students, as indicated by the high level of digital skills observed in Iji and Abah (2019), serve as avenues for empowerment and economic sustenance (Onwumere & Adigwe, 2017). This level and quality of access to ICT infrastructures plays an important role in determining the country's technological innovation and technical efficiency (Campisi, De Nicola, Farhadi & Mancuso, 2013; Batalla-Busquets & Myrthianos, 2015).

Sustainability has been considered to be a paradigm for thinking about a future in which environmental, societal, and economic considerations are balanced in the pursuit of development and improved quality of life (McKeown, 2002). The results of digital inclusion imply students and youths in Nigeria are equipped with the right social media skills to chart the course of political governance in the country. The level

of digital inclusion and internet skills can be seen as an appraisal of the potential of ICT as a tool for participatory democracy in Nigeria (Unwuchola, Adinlewa & Udeh, 2017). Electoral stakeholders, especially the electorates, now have ubiquitous access to online services which have democratized the electoral effects as they offer citizens opportunities for more engagement in the political process. In what has come to be termed "digital democracy", the use of social media and other digital enterprises are becoming important tools for mobilizing youth, and for facilitating, encouraging, and building their capacity to take their rightful part in the development of modern democracy (Kundiri & Umar, 2017; Edinyang, Odey & Gimba, 2015). With the current level of digital inclusion in the country, the future of Nigeria's economic and social transformation rests on the ability to effectively translate the large youthful population of the country into a demographic dividend. Through social media platforms like Facebook, Instagram, WhatsApp and YouTube, Nigerian youths now have access to political information and can interact directly with political candidates (Abdu, Mohamad & Muda, 2016; Uzochukwu & Ekwugha, 2014). The utility of these platforms was specifically acknowledged by President Buhari at his inauguration on May 29, 2015 while thanking "thanking those tirelessly carried the campaign on social media"(Odeyemi & Mosunmola, 2015). Evidently, the internet skills covered in this study are an indication that despite existing unfavourable context in Nigeria, youths will, however, continue to negotiate and force their way to political participation and economic success.

Conclusion

This review has highlighted the central issues in the dynamics of digital inclusion for any nation. The nation Nigeria is fast growing into a huge technology hub as evidenced by several reports on broadband and digital technology penetration in the country. With the current level of digital inclusion in the country, the future of Nigeria's economic and social transformation rests on the ability to effectively translate the large youthful population of the country into a demographic dividend.

References

Abdu, S. D., Mohamad, B. & Muda, S. (2016). New perspectives to political participation among youth: The impact of facebook usage. *International Soft Science Conference 2016*. pp 127-134.

Ayoola-Akinjobi, O. & Akinseye, E. M. (2016). Alleviating poverty among Nigeria youth through ICT: A case study of Akure Ondo State, Nigeria. *NG – Journal of Social Development, 5(2)*, 66-71.

Batalla-Busquets, J.-M. & Myrthianos, V. (2015). The impact of innovation and the use of ICTs on human capital development in Spanish industry. *Intangible Capiatal, 11(2),* 249-269.

Campisi, D., De Nicola, A., Farhadi, M. & Mancuso, P. (2013). Discovering the impact of ICT, FDI and human capital on GDP: A cross-sectional analysis*: International Journal of Engineering Business Management, 5(46),* 1-10. DOI: 10.5772/56922.

ECDL Foundation (2016). Perception and reality: Measuring digital skills in Europe. The eSkills for job campaign. Retrieved on 29th December, 2017 from http://www.ecdl.org

Edinyang, S. D., Odey, C. O. & Gimba, J. (2015). ICT and knowledge integration for social development in Nigeria. *British Journal of Education, 3(10)*, 13-21.

Federal Communications Commission – FCC (2017). Strategies and recommendations for promoting digital inclusion. Washington, DC: Consumer and Government Bureau, FCC. Pp 1-29.

Frank, R. H. & Bernanke, B. S. (2007). *Principle of microeconomics*. New York: McGraw-Hill/Irwin.

Gapski, H. (2007). Some reflections on digital literacy. *Proceedings on the 3rd International Workshop on Digital Literacy* held at Sissi, Lassithi, Crete Greece on 17th September, 2007. pp 49-55.

Helsper, E. (2008). *Digital inclusion: An analysis of social disadvantage and the information society*. London, UK: Department for Communities and Local Government. Pp 1-81.

Iji, C. O. & Abah, J. A. (2019). Internet skills as a measure of digital inclusion among mathematics education students: Implications for sustainable human capital development in Nigeria. *International Journal of Education and Knowledge Management (IJEKM) 2(1)*, 1-16. A publication of Research Publishing Academy, London, UK. Retrieved on 1st March, 2019 from https://rpajournals.com/wp-content/uploads/2019/02/IJEKM-01-2019-06.pdf

Iji, C. O. & Abah, J. A. (2017). Exploring Gender Differences in Graduation Proficiency in Mathematics Education Using a Markov Chain Model: Implications for Economic Growth in Nigeria. *International Journal of Educational Excellence, 3(2)*, 75-86. DOI: 10.18562/IJEE.028 . A publication of Sistema Universitario Ana G. Mendez (SUAGM), Universidad Metropolitana (UMET), Escuela de Educación, San Juan, PR 00928-1150, US. Retrieved on 1st March, 2019 from http://www.anagmendez.net/umet/pdf/ijee_onwu_abah_3_2_75_86.pdf

Iji, C. O., Abah, J. A. & Anyor, J. W. (2018). Educational Cloud Services and the Mathematics Confidence, Affective Engagement, and Behavioral Engagement of Mathematics Education Students in Public Universities in Benue State, Nigeria. *International Journal of Teaching and Learning in Higher Education, 30(1)*, 47-60. A publication of The International Society for Exploring Teaching and Learning (ISETL), Georgia, USA. Retrieved on 25 May, 2018 from http://www.isetl.org/ijtlhe/articleView.cfm?id=2825

Iji, C.O., Abah, J. A. & Anyor, J.W. (2017). Impact of cloud services on students' attitude towards mathematics education in public universities in Benue State, Nigeria. *International Journal of Research in Education and Science (IJRES), 3(1)*, 228-244. A publication of the International Society for Research in Education and Science (ISRES). Retrieved on 1st February, 2018 from http://dergipark.ulakbim.gov.tr/ijres/article/download/5000202010/5000179858

Izushi, H. & Huggins, R. (2004). Empirical analysis of human capital development and economic growth in European regions. In P. Descy & M. Tessaring (Eds.), *Impact of Education and Training*. pp 75-116. Thessaloniki: Cedfop

Kundiri, A. M. & Umar, M. B. (2017). Rethinking youth economic empowerment in Nigeria: Deepened democratization, entrepreneurship and ICT as tactical options. *Journal of Research in Humanities and Social Science, 5(3)*, 51-58.

Lovric, L. (2012). Information – communication technology impact on labor productivity. *Zb. Rad. Ekon. Fak. Rij, 30(2)*, 223-245.

Marien, I. & Prodnik, J. A. (2014). Digital inclusion and user (dis)empowerment: A critical prespective. *Info, 16(6),* 35-47. DOI: 10.1108/info-07-2014-0030.

McKeown, R. (2002). Education for sustainable development toolkit: Version 2. Retrieved on 17th May, 2018 from http://www.esdtoolkit.org

Murray, M. C. & Perez, J. (2014). Unraveling the digital literacy paradox: How higher education fails at the fourth literacy. *Issues in Informing Science and Information Technology, 11,* 85-100.

National Infromation Technology Development agency – NITDA (2016). *ICT4D strategic action plan implementation: Status update and illustrations book.* Abuja: NITDA. Pp 1-72.

Nigerian Comunications Commission (2018). Subscriber statistics. Retrieved on 2nd February, 2018 from https://ncc.gov.ng/13-stakeholder-information/statistics-reports

Odeyemi, T. I. & Mosunmola, O. O. (2015). Stakeholders, ICTs platforms and the 2015 general elections in Nigeria. National Conference on "The 2015 General Elections in Nigeria: The Real Issues" held July 27-28, 2015 at the Electoral Institute, Independent National Electoral Commission, Abuja, Nigeria.

Oluwatobi, S. O., Olurinola, I. O. & Taiwo, O. (2016). Human capital development in sub-saharan Africa: The role of ICT. *Journal of Economics Studies and Research, Vol. 2016(2016)*, Article ID 564389. DOI: 10.5171/2016.564389.

Onwumere, A. A. & Adigwe, A. I. (2017). ICT and youth empowerment in Nigeria. *Journal of Public Administration and Social Welfare Research, 2(1)*, 39-47.

Reder, S. (2015). *Digital inclusion and digital literacies in the United States: A portrait from PIAAC's survey of adult skill*s. US PIAAC Commissioned Paper, February, 2015. Washington, DC: US Program for the International Assessment of Adult Competencies. Pp 1-28.

Shuaibu, M. & Oladayo, P. T. (2016). Determinants of human capital development in Africa: A panel data analysis. *Oeconomia Copernicana, 7(4),* 523-549. DOI: http://dx.doi.org/10.12775/OeC.2016.030

Surman, M., Gardner, C. & Ascher, D. (2014). Local content, smartphones and digital inclusion. *Innovations, Special Issue,* 67-78.

Thatcher, A. (2011). A psychological model to understand e-adaption in the context of the digital divide. In J. Steyn & G. Johanson (Eds.), *ICTs and sustainable solutions for the digital divide: Theory and perspectives.* Hershey, PA: Information Science Reference. Pp 1-365.

Thomas, J., Barraket, J., Ewing, S., MacDonald, T., Mundell, M. & Tucker, J. (2016). *Measuring Australia's digital divide: The Australian Digital Inclusion Index 2016.* Swinburne University of Technology, Melbourne, for Telstra. DOI: 10.4225/50/57A7D17127384.

Twinpine Network (2017). *2016* Nigeria mobile trends report. Retrieved on 2nd February, 2018 from http://twinpinenetwork.com/report/

UK Online Centres (2007). *Digital inclusion: A discussion of the evidence base*. London: FreshMinds. Pp 1-51.

UNESCO (2005). *Guidelines and recommendations for reorienting teacher education to address sustainability: Education for sustainable development in action.* Technical Paper No. 2. Paris: UNESCO. Pp 1-74.

Unwuchola, A. A., Adinlewa, T. & Udeh, K. (2017). An appraisal of the role of ICT as a tool for participatory democracy in Nigeria. *MCC, 1(1),* 69-87.

Uzochukwu, C. E. & Ekwugha, U. P. (2014). New media and youth's online civic engagement in Nigerian politics: Potentials and challenges. *European Scientific Journal, 10(19)*, 203-221.

West, D. & Heath, D. (2009). Moving forward on digital inclusion: A framework for integrating research, policy and practice. *Journal of Social Science Intervention: Theory and Practice, 18(2)*, 5-28.