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Complexity Thinking and Broadband Internet Penetration in Lagos, Nigeria

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Abstract

Complexity Thinking and Broadband Internet Penetration in Lagos, Nigeria

by

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MA, University of Lagos, 2014

BS, Olabisi Onabanjo University, 2008

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

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Abstract

Considering the speed at which information and knowledge can transverse nations and organizations, the importance of broadband Internet connectivity cannot be overstated. The general problem is that the Nigerian broadband Internet penetration is considerably low, at 33% compared to other parts of the world. The specific problem is that community members and leaders have the behavioral intention to allow broadband Internet infrastructure deployment (BIID) at the local community level in Lagos. The purpose of this quantitative correlational study was to examine the relationship between perceived usefulness (PU), perceived benefits (PB), perceived ease of use (PEoU), and perceive security (PS), and community members and leaders' behavioral intention (BI) to allow broadband BIID at the local community level in Lagos. The study used the technology acceptance model by Davis and the general system theory by Von Bertalanffy as theoretical frameworks. Data was collected from 129 participants across three selected local communities in Lagos using an online Survey. Multiple regression analysis was used to test the strength of the relationship between complexity thinking (PU, PB, PEoU, PS) and broadband Internet penetration (BIID) using an SPSS package. PB and PS were found to have a statistically significant relationship with community members and leaders' BI to allow BIID at the local community in Lagos, Nigeria. PB was the most significant predictor. This research could lead to positive social change by identifying factors hindering broadband penetration, and more extensive broadband could lead to greater economic growth and reduced levels of poverty in Nigeria.

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Dedication

I dedicate this study to my God, my Creator, and my Guide who gave me the strength, knowledge, and financial power to complete this program. Special thanks to my late father, Hyacinth Elaiwonu Akpoja, my untiring mother, now a widow for their support throughout my foundational academic programs and the patience for me to reach this pinnacle. May I also dedicate this research to my wife, Mrs. Blessing Akpoja, and my children for all the sacrifices of staying without me for nights and days to ensure I make this significant progress to the finishing line. I also dedicate this study to my closest academic friend, Ifechi Umeh for the frequent support, encouragement, and words of advice. I may not have attained this milestone without your push. Thank you very much.

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Chapter 1: Introduction to the Study

Scholars and practitioners globally agree that the world is shrinking fast into a global village due to globalization and technological revolution (Adepetun, 2019; Nwankwo, 2018; Ogunfuwa, 2017; World Economic Forum, 2019). Corporations are becoming localized due to the collapse of international boundaries and technology disruption (Ford et al., 2017). Only countries with the correct answers to the technological disruptions can attract foreign direct investment, improve economic growth, and increase gross domestic product - GDP (Suleiman, 2020; Townsend et al., 2015).

Nigeria is one of the countries in the committee of nations in dire need of growth to provide an acceptable standard of living for its populace. Therefore, it is working hard to synchronize with the rest of the world on the technological revolution. Ubabukoh (2017) observed that information and technology experts in Nigeria agreed that the country must become a thinking nation to survive the technological disruption currently defining the new world order.

The Nigerian Presidential Committee on Broadband (2013) was inaugurated to craft a national broadband policy to serve as a policy map in a swift response to drive digitization and ensure that Nigeria attains a broadband penetration rate of 30% by 2018 (Presidential Committee on Broadband, 2013). In the President's mandate speech to the committee, President Goodluck Jonathan acknowledged the critical nature that "Internet and broadband have as the foundation for transformation to a knowledge-based economy" (Presidential Committee on Broadband, 2013, p. 9). Abang (2016) also aligned

with President Jonathan that broadband Internet is an enabler of the economy and social growth in the digital economy.

Background of the Study

Broadband Internet has the potential of enabling entire new industries and introducing significant efficiencies into education delivery, health care provision, energy management, ensuring public safety, government/citizen interaction, and the overall organization and dissemination of knowledge (Elebeke, 2019; Kelly & Rossotto, 2012; Ogunfuwa, 2017). The discussion so far has revealed that the importance of broadband Internet to the Nigerian economy is incalculable (World Bank, 2020a). However, the nation must also brace up to convert the accompanying challenges to opportunities.

The government, regulators, industry players, and watchers have yielded only a marginal result insignificant to make a reasonable difference in broadband infrastructure (Ogunfuwa, 2017). Meanwhile, the positive impact of broadband Internet in people's lives has been a subject of scholarly discourse. Kelly and Rossotto (2012) and Nwankwo (2018) agreed that broadband is a crucial success driver of the 21st century information age as electricity was to the industrial age. The authors summarized that any nation that ignores the current revolution of information and communications technology (ICT) towards broadband improvement would find it difficult to cope with global activities and trends.

Kelly and Rossotto (2012) argued that policymakers, regulators, and relevant stakeholders should identify issues and challenges in broadband development, especially in developing countries. The authors aimed to help readers analyze potential solutions

and provide practical examples of countries that have overcome broadband-related challenges. In what looks like a swift response to Kelly and Rossotto's assertion, the Nigerian Communications Commission (NCC; 2018, 2020) admitted that there is an obvious need to bridge the digital divide as a matter of emergency (Wamuyu, 2017). Onwuaso (2019) agreed with the regulator (NCC) and further suggested that the Nigerian regulator can strengthen broadband through new infrastructure company services (InfraCos). The author explained that InfraCo is an improvement strategy that the regulator intends to use to expand national broadband strategies. Onwuaso further elucidated that the executive vice-chairman (EVC), Prof. Umar Danbatta, has planned to disburse take-off grants as subsidies to the InfraCos to facilitate broadband infrastructure. Other scholars, especially Abang (2016) and Elebeke (2019) recognized that the world's developed economies had made significant progress in broadband development. But, the developing nations, especially Nigeria, are yet to make the same progress with broadband in sub-Saharan Africa.

As the argument ensues, the situation deteriorates with a sharp decline in broadband Internet penetration rates as the population increases rapidly (World Population Review, 2019). Some industry leaders argued that the slow growth in the telecoms industry in Nigeria relates to uncertainties caused by the tense political terrain and internal crises (Ogunfuwa, 2017). However, Teniola (2017) had a different opinion from Ogunfuwa. Teniola cited primary infrastructural decay, inadequate regulation, and the forex problem. Other issues are budget delays and economic crises as the reasons for the low penetration rate of broadband Internet in Nigeria. There is a need to adopt a

paradigm shift in the view of Adepetun (2019), who is a telecommunication journalist in Nigeria. Adepetun agreed with Fortunato et al. (2013) that the leadership in the states and the rural communities could play significant roles in developing the broadband and telecommunication fiber infrastructure. Adepetun suggested that policymakers must look away from the traditionally known factors and create awareness and sensitize communities to understand broadband Internet benefits. Adepetun's observation triggered the need to look apart from the traditional factors (TFs) that scholars and industry actors had enumerated as the reasons for low broadband penetration. I focused this study on the nontraditional factors (NTFs) that I categorized as complexity thinking factors ignored in previous literature resources as possible reasons for the low broadband penetration rate in Lagos, Nigeria.

The inspiration for this study hinged on the technology acceptance model (TAM) theory by Davis (1989) and general system theory (GST) by Von Bertalanffy (1972) as the theoretical foundations of this study. The effect of the TFs on broadband, though indisputable, has so far failed to produce the desired result. Therefore, the new thinking is to consider the other societal factors, the people side that may affect the deployment of broadband infrastructure. In the TAM theory, Davis focused on why people accept or reject the use of information technology. The author predicated the findings on the extent to which people believe that technology will help to make their job easier perceived usefulness (PU) and the difficulty of adopting and using such technology; PEoU (Davis, 1989; Ishola, 2017; Obinkyereh, 2017). Von Bertalanffy’s interest was about an open system that produces a complex interaction on the GST. The theory provides that a

system is a set of interrelated elements standing about the environment (McMahon & Patton, 2018; Von Bertalanffy, 1972). I produced a conceptual model to show how the several complexity thinking factors had been neglected in previous literature resources and might be affecting the broadband Internet in Lagos, Nigeria. I chose to focus on PU, perceived benefit (PB), PEoU, and perceived security (PS) to examine if there is a significant relationship with broadband Internet penetration in Lagos (community members' and leaders' behavioral intention (BI) to allow broadband Internet infrastructure deployment (BIID). I would recommend to the respective authorities how fixing the complex thinking factors could transform the economy and reduce the poverty rate and social vices.

Problem Statement

In its 2010 report, the World Bank sets an acceptable Internet global penetration rate of 76.2% for every 100 persons" (Kelly & Rossotto, 2012, p. 5). Nigerian broadband penetration hovers around 33%, with over 200 million people (Communication Week, 2019; Onwuaso, 2019; World Population Review, 2019). Scholars and industry practitioners have cited several TFs like agency regulation, multiple taxations, tense political environment, inadequate budgetary provision, and more responsible for the low broadband penetration (Ogunfuwa, 2017; Teniola, 2017). A cursory study of past scholarly exploration on broadband penetration in Nigeria indicates a scarcity of academic thoughts on how PU, PEoU, PB, and PS relate to broadband Internet penetration in Lagos. Community members' and leaders' BI to allow BIID represents

broadband Internet penetration in this study. The government has implemented some of the TFs in the past with no significant improvement (Adepetun, 2019).

The general problem to be addressed in this study was that the Nigerian broadband penetration rate is considerably low, at 33% compared to other parts of the world (Communication Week, 2019; Onwuaso, 2019). The flat broadband Internet penetration rate might be responsible for the slow pace of socioeconomic development, economic downturn, increased poverty rate, and social vices (Ogunfuwa, 2017; Townsend et al., 2015;). The specific problem is community members' and leaders' BI to allow BIID at the local community level in Lagos (Adepetun, 2019; Onwuaso, 2019).

Purpose of the Study

The purpose of this quantitative correlational study is to examine the relationship between PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos. The target population for this study included community members and leaders from three purposively selected local communities in Lagos State, Nigeria. The communities were Igbe-Ikorodu, Gowon Estate, and Idumagbo Avenue-Lagos Island (see Adeniyi et al., 2019; Lagos State Government, 2012). The independent variables were PU, PB, PEoU, and PS, and the dependent variable was community members' and leaders' BI to allow BIID. The study could help the policymakers identify the possible mitigation factors that may improve broadband Internet penetration. The positive social change effect aligns with Ogunfuwa's (2017), and Elebeke's (2019) postulations that enhanced broadband Internet penetration translates to improved economic growth, less poverty, and social vices reduction.

I used Pearson's correlation and multiple regression analysis to test the strength of the relationship between the complexity thinking factors (PU, PB, PEoU, PS) and community members' and leaders' BI to allow BIID at the local community level in Lagos. Understanding the strength of the relationship could enable policymakers to identify the reasons for low broadband Internet penetration in Lagos and make the appropriate improvement decisions. I used the TAM theory (Davis, 1989) to focus on the reasons for community members' and leaders' BI to allow BIID. TAM also provided the opportunity to synchronize the constructs of complexity thinking factors and the GST by Von Bertalanffy (1972) relating to the complex system to examine the variables, the extent of the relationship between the broken link or neglected part (complexity thinking factors) in a complex interaction and the whole (community members' and leaders' BI to allow BIID at the local community level in Lagos)

Research Question and Hypotheses

RQ: How does PU, PEoU, PB, PS relate to community members' and leaders' BI to allow BIID at the local community level in Lagos?

H_0: There is no relationship between PU, PEoU, PB, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos.

H_A: There is a relationship between PU, PEoU, PB, PS, and community members, and leaders' BI to allow BIID at the local community level in Lagos.

Theoretical Foundation

Two different theoretical frameworks drove the study, the TAM by Davis (1989) and the GST by Von Bertalanffy (1972). The reason for using two theoretical models for

this study aligns with Thomas's (2020) and Kamara's (2020) thoughts that a combination of theories to assess a phenomenon can engender varying perspectives, alignment, and clarification. TAM and GST as the theoretical frameworks for this study unlocked the different trajectories that drove the underlying philosophy of this study.

The TAM theory has its foundation in the works of Davis (1989), a veteran United States technology professor, writer, and publisher. The author postulated that technology users face some options to use or not to use technology. Davis (1989) categorized these criteria as PU and PEoU. PU is the extent to which a person believes that a particular system or technology would enhance job performance. At the same time, PEoU is the belief that the use of a system or technology should be free of effort (Davis, 1989). Several authors and researchers had adopted Davis' TAM theory because of its expanded view and ease of understanding (Ishola, 2017; Obinkyereh, 2017; Rafique et al., 2020; Schmidthuber et al., 2020; Venkatesh & Davis, 2000; Wang, Wang et al., 2020).

I leveraged the flexibility of the TAM model to adopt it for the construct of the predictor variables of this study. I used four constructs in this study: PU, PEoU, PB, PS. Two of the constructs (PU and PEoU) were from the original TAM model (Davis, 1989), and the other two (PB and PS) were from a similar quantitative study by Obinkyereh (2017). I examined the relationship between the independent variables of PU, PB, PEoU, and PS and the dependent variable of community members' and leaders' BI to allow BIID at the local community level in Lagos.

The GST has its footing in the works of Von Bertalanffy (1972). Von Bertalanffy's interest was about an open system that produces a complex interaction. The theory states that a "system" is a set of interconnected components in an environment (McMahon & Patton, 2018). Von Bertalanffy connects an organization to an open system with inherent dynamic interactions. One of the popular postulations of the theory is that single parts and processes are deficient in providing a vital phenomenon. An exhaustive observation of the works of the system theorists revealed that the wellness of the different fragments that build up the whole determines the whole's level of collaboration (Chatterjee et al., 2017; Greenhalgh, 2020). It is adequate to summarize that the parts are equally important as the sum; in fact, conscious coordination of these variables is inevitable for business survival. Systemic thinking underpins many contemporary disciplines, and it provides the most reliable foundation for the dynamics of today's complex business environments (Selvarajah et al., 2020). Complex thinking and broadband Internet penetration are topics that I deliberately crafted to investigate the relationship between the NTFs (PU, PB, PEoU, PS) and of community members' and leaders' BI to allow BIID at the local community level in Lagos.

Researchers of the various peer-reviewed articles and the Nigerian telecommunication industry publications had limited the problem of broadband penetration in Nigeria to the deficit in the TFs of agency regulation, multiple taxations, tense political environment, inadequate budgetary provision, and more as responsible for the low broadband penetration (Jayakar, 2018; Ogunfuwa, 2017; Teniola, 2017).

The GST encourages systemic thinking advised on the need to look beyond the TFs to consider other complexity factors or NTFs that may be the reason for the low broadband penetration rate despite previous efforts. The gap is that none of the literature resources addressed or linked these complexity thinking/ NTFs (PU, PEoU, PB, and PS) to broadband Internet penetration in Lagos, Nigeria. In this quantitative correlational study, I highlighted specific complexity thinking factors (PU, PEoU, PB, and PS) that might affect Lagos's broadband Internet penetration rate. The study's result might be an empirical dataset that becomes a reference case for policymakers and telecommunication companies' leaders in Nigeria to understand how the TAM variables and systemic thinking relate directly to the challenges confronting broadband penetration.

Nature of the Study

Some methodological assumptions drove this correlation study. Complexity thinking, theoretically explained by the TAM variables and systems thinking lens of the GST, was used to explore the extent to which PU, PB, PEoU, PS predict broadband Internet in the form of community members' and leaders' BI to allow BIID at the local community level in Lagos. This study had four independent variables: PU, PEoU, PB, and PS as complexity thinking factors and community members and leaders' BI to allow BIID at the local community level in Lagos (dependent variable).

The choice of the quantitative methodology was to satisfy the objective of achieving reasonable breadth in the study's context. It enabled the generalization of the survey results across similar community settlements in the other states in Nigeria. Community members and leaders' BI to allow BIID at the local community level in

Lagos is a verifiable external reality by the inhabitants of the selected communities that I investigated empirically. Knowledge is constructed by sampling the individuals' responses in the community rather than physical scientific representation (Burkholder et al., 2016).

The research population consisted of broadband Internet users in three purposively identified local communities Igbe-Ikorodu, Gowon Estate, and Idumagbo Avenue-Lagos Island in Lagos. I used a primary data collection method using SurveyMonkey and shared the link to the survey questionnaire on the community's social media platforms. The community members and leaders on the platforms randomly and virtually completed the questionnaires by clicking on the link (see Tashkandi et al., 2020). The sampling procedure shall purposively select the communities and stratify for only Internet users on the chosen social media platforms.

The epistemological and ontological underpinning of this research favored adopting a quantitative methodology (see Burkholder et al., 2016). The knowledge from internalizing the theoretical strands of TAM and system thinking into complexity thinking tested the relationship between PU, PEoU, PB, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos. The inquiry into establishing the relationship triggers the epistemological purists' view to subscribe to a humanistic science model of postpositivism.

The correlational design was the most appropriate for the study. It measures the relationship between independent variables (in this study, PU, PEoU, PB, and PS) and a dependent variable (in this study, community members' and leaders' BI to allow BIID at

the local community level in Lagos; Crilly, 2019; Gray, 2019; Sanders, 2019. I used Pearson's correlation and multiple regression analysis to test the strength of the relationship between each of the complexity thinking factors of PU, PEoU, PB, and PS (independent variables) and the dependent variable (community members' and leaders' BI to allow BIID at the local community level). I used a statistical software package for the social sciences (SPSS) to analyze it.

Definitions

Broadband internet services (BIS): BIS refers to the higher speed of Internet services provisioning different from the traditional Internet speed or the narrowband (Falch & Iaskio, 2019). Scholars unanimously agreed that broadband is a crucial success driver of the 21st-century information age as electricity was to the industrial era (Hanif et al., 2018; Kelly & Rossotto, 2012; Olaide et al., 2017). Jayakar (2018) argued that any nation that ignores the current revolution of ICT would find it difficult to cope with global activities and trends.

Broadband penetration rate (BPR): BPR refers to the spread of broadband services across a geographical area. The U.S. Federal Communications Commission (FCC; 2018) sets the broadband penetration rate as the new measurement standard for different countries. Križanović Čik and Rimac-Drje (2016) defined BPR as economic growth when a critical mass of broadband infrastructure is present. The various nations of the world identified the importance of keeping to a connected world. That is why there is a redefinition of national priority in improving the quality of communications infrastructure to improve BPR (Calandro et al., 2018; Ogunfuwa, 2017). Nigeria is still

struggling with meeting the rate despite addressing some of the identified challenges as TFs since the liberalization of the industry in 2001 (Ogunfuwa, 2017). Broadband differs from narrowband in the speed of connectivity.

Narrowband Internet Services (NIS): NIS refers to low-speed communication services of a lower rate for low data application services (Hiben et al., 2019). Some authors defined narrowband in its purest form as communication services that use a narrower frequency than broadband (Agiwal et al., 2019). I decided to narrow this study to complex thinking and broadband Internet penetration in Lagos, Nigeria, rather than narrowband to align with individuals' and businesses' social needs regarding speed and ease of doing business in the 21st century. The emphasis is on complex interaction or the relationship of NTFs and broadband Internet penetration as the new normal.

Complexity thinking (CT): The emergence of complexity as a concept has defied rational thinking. Scholars from different life works have struggled with ascribing the idea to a discipline (Galkina & Atkova, 2019; Hallo et al., 2020; Uhl-Bien & Marion, 2008). The field of complexity theory represents an integration of ideas from different disciplines like mathematics, physics, biology, information theory, artificial intelligence, and much more (Greenhalgh, 2020; Mamédio & Meyer, 2020; Uhl-Bien & Marion, 2008). The foundation of complexity leadership theory stems from Hallo et al.'s (2020) argument that traditional leadership theory has failed to provide a dependable explanation to the way organizations evolve through leadership in an information age.

The development process of complexity has given birth to complexity-based ideas that have established a track record in diverse scientific and mathematical communities

(Hallo et al., 2020; Uhl-Bien & Marion, 2008). This advancement necessitated crafting the constructs "Complex Adaptive System" at Santa Fe Institute, which has helped organizational understanding of complexities, complexity thinking, and broadband Internet penetration in Lagos (Hoogeboom & Wilderom, 2020). I decided to overlay the construct with PU, PEoU, PB, and PS (independent variables) and community members' and leaders' BI to allow BIID at the local community level (dependent variable).

Community members and leaders: Community members and leaders refer to the inhabitants of the local communities in Lagos selected for the study irrespective of state of origin, language, or religion.

Community members and leaders' behavioral intention to allow broadband internet infrastructure deployment: This refers to the perceived BI of the local community members and leaders towards the acceptance of broadband infrastructure deployment in their community (Adepetun, 2019; Ogunfuwa, 2017). I investigated the BI of the community members and leaders towards BIID using this study.

Traditional Factors (TFs): TFs are the factors that most industry actors believed to be responsible for the low broadband Internet penetration in Lagos, Nigeria. For instance, Ogunfuwa (2017) argued that the low broadband penetration in Nigeria was attributable to uncertainties caused by the tense political terrain and internal crises. At the same time, Teniola (2017) had a different opinion, citing primary infrastructural decay, inadequate regulation, forex problem, budget delays, and economic crises as factors responsible for the low broadband Internet penetration rate in Nigeria. The arguments amongst the industry policymakers are justifiable reasons I have categorized TFs as

multiple taxation, agency integration, tense political environment, budget, infrastructure deficit, and weak regulation.

Nontraditional factors (NTFs): The NTFs are the factors that I sought to investigate in the study, given the failure of broadband Internet despite the TFs that were addressed in some parts of Lagos, Nigeria. I have, therefore, operationalized the NTFs as complexity thinking factors throughout the study. These factors were PU, PEoU, PB, and PS (Obinkyereh, 2017; Rafique et al., 2020; Wang, Wang et al., 2020). I limit the scope of the proposed research by the number of NTFs of interest that I have chosen. I shall investigate the four NTFs to understand how they relate to community members' and leaders' BI to allow BIID at the local community level in Lagos.

Assumptions

I made several assumptions about the study that gave meanings or interpretations of the different sections of the survey. One such belief was that the three local communities selected as samples for collecting data represent several other communities. The members share similar characteristics and perceptions of technology infrastructure installation and public goods. I also assumed that the respondents to my questionnaires understand the speed of the Internet that differentiates narrowband Internet from broadband Internet. However, I structured my inquiry to be explicit on the meanings of the two different speed types. Another assumption was that the national telecommunication operators' statistics on the NCC, the regulator, give an accurate picture of the actual operators' data without error for reference purposes. However, I am

confident that because the data proves reliable in other life-transforming studies, the situation was different for this research.

Scope and Delimitations

This research examined any relationship between PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos. I decided to use primary data for this study. I generated the fundamental data from three purposively selected local communities in Lagos. I used SurveyMonkey to design the questionnaire and share the link on the social media platforms of the three selected communities. The sampling technique favors stratified sampling because I targeted only community members and leaders with internet access.

The TAM and the GST theories were the anchor theories of this research to explain the derivation of the constructs concerning technology acceptance or otherwise and the conceptual mindset that single parts and processes cannot provide a complete picture of a vital phenomenon. The relationship of my study with the system theorists showed that the constructs aligned with the theory (Davis, 1989; Obinkyereh, 2017), and the wellness of the different parts that made up the whole determined the whole's level of interaction (Greenhalgh, 2020; Von Bertalanffy, 1972). The TFs of multiple taxations, agency integration, tense political environment, budget, infrastructure deficit, and regulation might not sufficiently explain the low broadband Internet penetration in Lagos, Nigeria. Instead, there was a need to investigate the relationship between the NTFs of PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos.

Limitations

Research weaknesses and limitations are influences and impediments beyond the researcher's control (Marshall & Rossman, 2016; Onghena et al., 2018). The envisioned limitations of this study were related to generic research hitches that scholars have identified. I might have encountered resistance from some of the community leaders whom I proposed to survey. Data conservation is one of the problems confronting researchers in Nigeria (Ogunfuwa, 2017). The access to data that is not in the public domain from the regulator and some other relevant government agencies might have posed some challenges.

I was mindful of these constraints and had planned to go strictly with primary data for this study and use only published data in the various government websites to support my findings. I made a concerted effort to send a long-term notification email to some community leaders to secure their support, consent, and willingness to participate in filling the survey questionnaire. I recruited data collection research assistants from the three communities to help share the link to the SurveyMonkey questionnaire of the community's social media platforms (WhatsApp and Telegrams). The three assistants responded in the affirmative to help via email. Therefore, my data collection strategy was ready with the affirmation and commitment from all three selected communities.

Another limitation of this study stemmed from the understanding that I focused on the complexity thinking factors or NTFs and community members' and leaders' BI to allow BIID at the local community level in Lagos. These factors might not be the same

across different cultural environments, making it difficult to generalize the study's result beyond its cultural background.

I adopted a quantitative correlational study to examine the relationship between PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos. I used Pearson's correlation and multiple regression analysis to test the strength of the relationship between complex thinking/NTFs and broadband Internet penetration. A comprehensive comparison of BI of the community leaders from community members using the analysis of variance (ANOVA) produced a complete view of the phenomenon. There is a need to expand the study beyond understanding the strength of the relationship between these study's factors and the use of different cultural settings in future research.

Significance of the Study

The sub-Saharan Africa region, specifically Nigeria, is still struggling to find its bearing on the sweeping changes of the Internet revolution that impact almost every facet of human existence in today's world (Ogunfuwa, 2017; Presidential Committee on Broadband, 2013). In Nigeria, improving broadband Internet penetration is a challenging task. It is gradually becoming a near-impossible mission as several policies and go-live-dates have failed in the past. This study's significance was to examine the relationship between PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos. Identifying the fundamental problem of broadband development in Nigeria could transform the nation's economy from the macro perspective and the standard of living of the citizens (Elebeke, 2019; Kelly & Rossotto, 2012;

Ogunfuwa, 2017; Teniola, 2017). This research might address some social change problems of unemployment, increased poverty rate, and hunger that scholars consider major social problems (Elebeke, 2019; Onwuaso, 2019).

Significance to Theory

The research could contribute to the validity of Davis' (1989) TAM theory on the BI for technology adoption and Von Bertalanffy's (1972) GST theory on how the interaction or the wellness of the different parts determine the welfare of the whole in the context of an open system that produces complex interactions. Therefore, the study might change the industry leaders' and policymakers' understanding of Lagos, Nigeria's low broadband Internet penetration. The findings from this research could have validated or refuted Davis' (1989) TAM variables and Von Bertalanffy's (1972) stance on the wellness of the different parts determining the welfare of the whole. Determining how the nontraditional factors of PU, PB, PEoU, PS relate to community members' and leaders' BI to allow BIID at the local community level to determine the rate of broadband Internet penetration in Lagos Nigeria might challenge conventional knowledge in the practice of leadership and decision-making and provide an opportunity for further research.

Significance to Practice

Researchers could further explore the role of community integration and education in developmental strategic decision-making. The study might unravel solutions to the perennial problem of underdevelopment in other sectors of the Nigerian economy, aside from the telecommunication sector. The review of the current issues confronting broadband Internet penetration from a different perspective of the PU, PB, PEoU, PS

through research and not just deploying infrastructure can contribute to the leadership and organizational change. The evidence that emerged from the study could approve or refute Davis' TAM theory of BI and technology acceptance and Von Bertalanffy's GST system behavior. Focusing on how the wellness of the different parts determines the health of the whole in the context of an open system produces complex interactions.

Significance to Social Change

The world economy is on steady growth and development in large part because of broadband Internet networks and services (Kelly & Rossotto, 2012). A World Bank report stated that for every 10% increase in broadband Internet services, there is a corresponding 1.38% improvement in the GDP of low income and middle-income countries (Jayakar, 2018; Kelly & Rossotto, 2012; Urama & Ogbu, 2018). The 2017 Nigerian Telecommunication Commission industry report revealed that broadband contribution to the Nigerian GDP stood at 8.6% (NCC, 2018). The social effect of this research is a positive social transformation of the sectors of education, economy, agriculture, transportation, health, manufacturing, employment, and the overall well-being of the society through the drastic improvement of government processes and the global service delivery (International Telecommunications Union [ITU], 2017; Kelly & Rossotto, 2012; NCC, 2018; Nwankwo, 2018). Consequently, an improvement in the rate of broadband Internet penetration in any country is an effective form of a technological revolution. It could attract foreign direct investment, economic growth, poverty reduction, and reduced social vices leading to a positive social change effect.

Summary and Transition

In Chapter 1 of this study, I introduced the study from the perspective of the importance of broadband Internet, its penetration, and the impact on human lives and societies across the globe. The explanation in the background of the study section provided a lead into the potential adverse effect of low broadband Internet penetration on education, healthcare, transportation, employment, and the general standard of living as identified by Elebeke (2019), Kelly and Rossotto (2012), and Ogunfuwa (2017). The study background also presented clear indicators and insight on the reason for approaching the study from the perspective of complex thinking factors or NTFs that might affect broadband Internet penetration. I provide detailed explanations of the variables that I identified as NTFs in Chapter 2.

Chapter 1 streamlined my ontological and epistemological position by presenting the problem statements. It also separates the general research problem from the specific issue. I presented the purpose of the study, the research questions, and the hypotheses in such a way as to demonstrate a constant alignment through an iterative process. The theoretical foundation showed the tenets that define and shape the study's direction. I explained my position regarding validating or refuting past theorists' status on the predictor variables. In the Nature of the Study section, I presented the philosophical underpinning, the methodological drive, and the data-gathering strategy.

Furthermore, I presented some terms that I used in the study that might have multiple meanings and interpretations. I identified the study assumptions, scope and delimitation, limitations, and the significance of the study to theory, practice, and social

change. In Chapter 2 I give detailed, granular, and comprehensive explanations of other scholars' stances regarding the variables of interest and the overall study.

Chapter 2: Literature Review

The general problem addressed in this study was that at 33% the Nigerian broadband penetration rate is considerably low compared to other parts of the world (Communication Week, 2019; Onwuaso, 2019). Onwuaso (2019) charged the Nigerian regulator to strengthen broadband through new InfraCos. The specific problem is community members' and leaders' BI to allow BIID at the local community level in Lagos (Adepetun, 2019; Onwuaso, 2019). Adepetun (2019) argued that the leadership in the states and the rural communities could play a significant role in developing the fiber infrastructure that may translate to technological progress.

The purpose of this quantitative correlational study was to examine the relationship between PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos. The target population for this study included community members and leaders from three purposively selected local communities in Lagos State, Nigeria. The communities were Igbe-Ikorodu, Gowon Estate, and Idumagbo Avenue-Lagos Island (Adeniyi et al., 2019; Lagos State Government, 2012). The independent variables were PU, PB, PEoU, and PS, and the dependent variable was community members' and leaders' BI to allow BIID.

Literature Search Strategy

This study's literature search strategy is a relevant section that shows the strength of the previous scholarly explorations relating to the current research. I started gathering suitable materials for this study in 2015 when I enrolled in the program. The starting point was a deliberate assembly of relevant scholarly resources using a psychographic

segmentation approach. Psychographic segmentation is a marketing term used to group consumers and demographic, geographic, and behavioral attributes (Pitt et al., 2020). The strategy was to strengthen the literature resources that I deployed to complete this study. I borrowed the segmentation approach to organize the research into manageable sections.

I segmented the literature search by profession/discipline, research variables, and program specialization to facilitate the research's development and successful completion. I reviewed 120 industry-specific professional journal articles downloaded from weekly industry news publications and regulatory releases. I got 50 professional journal articles from Walden Library by searching the ABI/INFORM Collection and business source complete. Others sources were Thoreau's multidatabase search, EBSCO, ScienceDirect, SAGE Journals, IEEE Xplore Digital Library, ProQuest databases, and Google scholar. Furthermore, I searched for journal articles relating to complexity, TAM, and the GST linking directly to the study's independent variables. Further exploration of the databases brought forth 50 pertinent journal articles relating to leadership and organizational change as my program specialization.

The database search keywords were *broadband, Internet, rural connectivity, fiber optics, narrowband 4G technology, mobile Internet, information technology (IT), the Internet service provider (ISP),* and *wireless technology.* Other variable-related key terms were *complexity, complex thinking, system thinking, general system theory, complex adaptive system, poverty,* and *entropy.* More search keywords to accommodate the program specialization included *leadership, followership, global leadership,* and *virtual leadership.* Others were *corporate social responsibility (CSR), management, theory,*

knowledge management, team management, and *change management.* The list continued with *human resource development, community leadership, and membership relation*, and *technology acceptance model (TAM)*. The search sometimes involved the combination of these terms across databases and Google to produce the desired result.

The search strategy was to focus on scholarly articles published between 2015 to 2020. The intention was to ensure that the findings in the papers and the other literature resources were still helpful for the current study and relevant for 21st-century decision making. However, I included some older articles and books to explain the theoretical foundations of the research and some critical terms that I proposed to explain without diluting the proponent's fundamental knowledge. For instance, I hinged the study on the TAM theory by Davis (1989) and the GST by Von Bertalanffy (1972). Davis (1989) used the TAM to focus on the fundamental determinants of the use and acceptance of technology, while Von Bertalanffy (1972) studied the dynamics of an open system that produces complex interaction. I used peer-reviewed journal articles for this study. The exception was the industry publications and regulatory releases that provided the preliminary information to help domesticate the study to align with my ontological position.

Theoretical Foundation

The theoretical groundwork for this study hinged on two complementary frameworks: The TAM by Davis (1989) and the GST by Von Bertalanffy (1972). The use of two theoretical models for this study aligns with Thomas' (2020) and Kamara's (2020) thoughts that combining theories to assess a phenomenon engender varying perspectives,

alignment, and clarification of the researcher's philosophical objectives. TAM and GST as the theoretical frameworks for this study unlocked the different trajectories that drove the underlining philosophy of this study.

The Technology Acceptance Model Theory

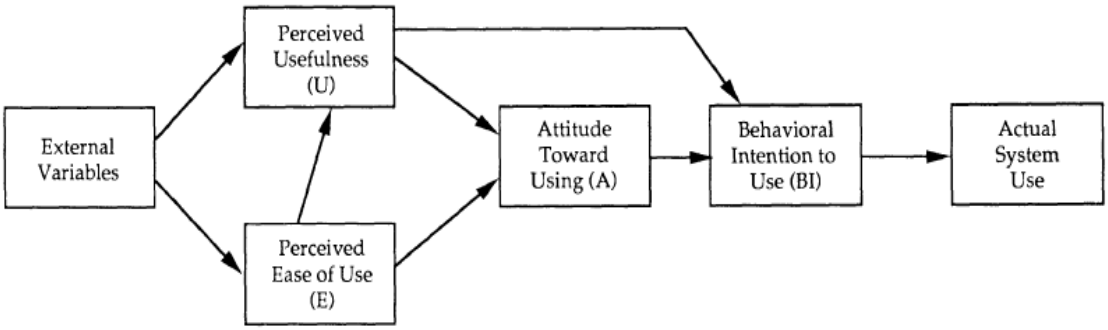
The TAM theory has its foundation in the works of Davis (1989), a veteran U.S. technology professor, writer, and publisher. The author hypothesized that technology users deal with some options to use or not to use technology. Davis' inherent motivation was to develop an acceptable measure that correlates with user behavior. Davis (1989) categorized these criteria as PU and PEoU. PU is the extent to which a person believes that a particular system or technology would enhance job performance. At the same time, PEoU is the notion that using a system or technology should be free of effort (Davis, 1989). Davis modified two critical theories to arrive at the TAM theory. The theory of reasoned action explains how perception drives an individual's behavior, and the theory of planned behavior postulates that individual behavior is a function of the individual's specific intention (Nassif, 2019). Davis et al. (1989) concluded theory of reasoned action and TAM are excellent predictors of why people reject or accept technology.

Several authors and researchers had adopted Davis' (1989) TAM theory because of its expanded view and ease of understanding (Ishola, 2017; Obinkyereh, 2017; Schmidthuber et al., 2020; Venkatesh & Davis, 2000). Others were Kamara, 2020; Kamal et al., 2020; Rafique et al., 2020; Sandema-Sombe, 2019; Wang, Wang et al., 2020. The list can go on to indicate the importance of the TAM model. Thus, the two key TAM constructs in the initial model by Davis could have a two-edged outcome on this study as

crucial determinants. For instance, TAM's PEoU construct could predict that community members and leaders share a specific BI towards broadband infrastructure deployment. The choice could be positive or negative depending on the research outcome. Similarly, the PU construct could propose that BIID would enhance community members' and leaders' effectiveness and life transformation. The detailed understanding of the conceptualized relation between TAM and BIID could be deduced from the initial TAM model by Davis et al. (1989) as depicted.

Figure 1

The Novel Technology Acceptance Model



Adapted from the "User acceptance of computer technology: a comparison of two theoretical models" by Davis et al., 1989, p. 985, *Management Science, 35*(8).

The model shows that BI determines technology usage. However, BI is a function of the individual's attitude towards technology usage (A) and the PU of the technology (U) represented by the regression equation BI = A+U…eq1 (Davis et al., 1989; Obinkyereh, 2017). It, therefore, implies that the equation could be A-BI (eq2), denoting that people could build up the intention to perform behavior where they perceive positive outcomes (Rafique et al., 2020). Nassif (2019) observed that people could imagine an

exciting twist in U-BI (eq3) that people would not form intention towards behavior that will not improve job performance despite the positive or negative feelings towards such behavior. Davis et al. (1989) explained why enhanced performance is an essential variable for extrinsic rewards in the workplace. Therefore, an example of an eternal variable in figure 1 could be a cognitive appraisal. A particular intention towards a system or technology could trigger an attitude that leads to improved performance. The model paved the way to several other postulations, including cognitive appraisals leading to the crafting of additional TAM constructs.

Nassif (2019) conducted a correlational quantitative inquiry using the TAM model. The author adopted additional predictive TAM constructs to investigate a possible relation between IT Solution Architect's PS, perceived privacy, perceived connectedness, perceived complexity, PU, and PEoU with the intent to adopt a cloud computing system (CCS) in Afghanistan. Nassif used the enhanced TAM model (ETAM or TAM) as the theoretical framework. The model enabled the expansion of the original TAM constructs of PU and PEoU using cognitive appraisal on the external variables. The scholar found that PeS, PeP, and perceived connectedness had a more substantial positive impact on IT Architects' BI to use CCS while PeC had an insignificantly weak effect. Nassif (2019) admitted that the study had its scope and methodological limitations. Future researchers could consider a different research design in geographical settings.

Kamal et al. (2020) did an extensive investigation of the adoption of telemedicine services using an ETAM model. Kamal et al. aligned with previous scholars that complexity is the extent to which users perceived innovation to be relatively tricky. The

scholars concluded that a broad range of technology innovation types requires a deep understanding of the relationship between compatibility, relative advantage, and complexity. The special attention on Davis' (1989) TAM model attracted scholars from different spheres to relate different behavioral streams to the adoption and use of innovations. The authors advised future researchers to explore the TAM model on other BIs.

I got permission to use the survey instrument of the study by Obinkyereh (2017) for this research (see appendix A). Obinkyereh (2017) explored a quantitative correlational survey to examine the factors determining cloud computing adoption by information technology professionals in Ghana, West Africa. The author used the TAM constructs of PU, PEoU, PB, PS, and PA of information systems and cloud computing adoption in Ghana. The scholar found a significant relationship between PU, PEoU, PB, PS, PA, and CCS adoption in Ghana. In this study, I intend to examine further Obinkyereh's (2017) TAM constructs in a different geographical location, population, and technology platform. I proposed to conduct a quantitative correlational study to examine the relationship between PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos. It is important to note that I used only the four related constructs suitable to measure BI on the chosen broadband Internet technology.

I leveraged the flexibility of the TAM model to adopt it for the construct of the predictor variables. I used four constructs in this study; PU, PEoU, PB, PS. Two of the constructs (PU and PEoU) from the original TAM model (Davis, 1989) and the other two

(PB and PS) from a similar quantitative study by Obinkyereh (2017). I examined the relationship between the independent variable of PU, PB, PEoU, PS. And the dependent variable of community members' and leaders' BI to allow BIID at the local community level in Lagos.

The General System Theory

The GST explores the works of Von Bertalanffy (1972). The American Biologist's interest was about an open system that produces a complex interaction. The GST provides that a "system" is a set of interrelated elements standing about the environment (McMahon & Patton, 2018). The Biologist equates an organization to an open system that requires more than the different dimensions of interactions. Single parts and processes cannot provide a complete picture of a vital phenomenon.

Complex adaptive scholars established a unanimous standpoint that the theory offers the best explanation for why the wellness of the different parts of any interrelated system determines the level of interaction of the whole (Chatterjee et al., 2017; Greenhalgh, 2020). Therefore, it is right to summarize that the parts are as equally important as the whole, and in fact, conscious coordination of these variables is inevitable for business survival. Systemic thinking underpins many contemporary disciplines, and indeed, it provides the most reliable foundation for the dynamics of today's complex business environments (Selvarajah et al., 2020). Complex thinking and broadband Internet penetration is a topic that I deliberately crafted to investigate the relationship between the non-traditional/complexity thinking factors and broadband Internet penetration at the local community level in Lagos.

The application of GST is not limited to this study. Several other researchers have applied the GST in a multifaceted circumstance to unravel complex adaptive societal problems that had improved human welfare and contributed to positive social change. Okoye (2017) embarked on a qualitative multiple case study using the GST to investigate strategies to minimize the effects of information security threats on business performance. The author employed the GST and transformational leadership theories to explore the processes that reduce the impact of information security threats on business performance.

The author argued that SME leaders use a practical strategy and leadership skills to minimize information security threats on business performance (Okoye, 2017). Okoye found that the best approach for SMEs to mitigate the impact of information security threats on business performance was implementing information security strategies working as reliable parts to strengthen the whole (Okoye, 2017). The study aligned with the GST philosophical stance that single features and processes cannot provide a complete picture of a vital phenomenon unless they work in an interrelated fashion to shape the whole.

Belluomini (2016) conducted another exciting study to investigate the combined effect of technology self-efficacy and practice outcomes on digitally immigrant social work faculty. The author used the duo of GST and self-efficacy theories, adopting a mixed-method grounded research design to achieve triangulation and rigor. Belluomini (2016) found that digitally immigrant social works education (DISWE) requires the injection of the social work integration model for technology (SWIM-T) to provide the

critical mass that is needed to develop technology literacy in the field. The researcher also provides an evidence-based response to a growing technologically literate society.

The study aligns with Von Bertalanffy's (1972) theory that the interrelated elements that form a system must coordinate in a way that projects a stronger whole. The DISWE project may not thrive insolation without the integration of a suitable technological model. Greenhalgh (2020) argued that researchers should view the missing link making a system incomplete from a complexity standpoint to bridge the gap between research and practice.

Ragab (2016) applied GST to assess how information technology adoption by small business owners has transformed the small business enterprises (SBE) sub-sector. The author used the GST in a qualitative multiple case study inquiry to understand the depth of the strategies that SBE uses to implement IT solutions for increased profitability. Ragab found that small business enterprises (SBEs) use planned methods of flexible organizational culture for adopting and implementing information technology (IT) solutions to increase the profitability of the businesses (Ragab, 2016). The author concluded that business owners must acknowledge that one strategy is not enough for organizations to make a reasonable profit. Multiple factors must work together to achieve an acceptable measure of success (Anderson, 2019; Ragab, 2016).

The findings aligned with the tenet of the GST that single parts and processes cannot provide a complete picture of a vital phenomenon for leadership decision-making (Selvarajah et al., 2020; Von Bertalanffy, 1972). Therefore, multiple factors working

together in a related fashion may provide the critical success factors for small business enterprises (SBE).

More researchers continue to explore using the GST in combination with other theories. The extent of work depends on the epistemology and ontological stance of the authors. In a related study to investigate the leadership strategies for reducing regulatory citations to maintain tax-Exempt Statuses in nonprofit organizations, Kamara (2020) used the GST and supported it with Transformational leadership theory. The author conducted a qualitative case study research to investigate the strategies that nonprofit organizations in Pennsylvania use for decreasing regulatory citations to maintain their tax-exempt status.

Kamara (2020) found leaders should use a mix of different strategies, including the collaboration of work effort and share workable strategies to prevent burnout and minimize turnover in a nonprofit organization. The analysis also revealed that effective communication and teamwork are crucial ingredients for the success of any organization. The scholar used the GST to identify a study with a significant implication on leadership practice. For instance, the conclusion that regulatory demands should matter to leaders at different levels, whether profit or nonprofit, to avoid citations, fines, and revocation of business licenses (Kamara, 2020), has a massive implication for leadership practice.

The GST provides an essential framework for establishing and reiterating the need for leaders to focus on the details in a value chain affecting a phenomenon (McMahon & Patton, 2018). Researchers of the various peer-reviewed articles and the Nigerian telecommunication industry publications had limited the problem of broadband

Internet penetration in Nigeria to deficits in the TFs of agency regulation, multiple taxations, tensed political environment, inadequate budgetary provision, and more as responsible for the low broadband penetration (Jayakar, 2018; Ogunfuwa, 2017; Teniola, 2017). However, the GST that encourages systemic thinking advised the need to look beyond the TFs to consider other complex factors or non-TFs that may be the reason for the low broadband penetration rate despite previous efforts.

Understanding and examining the relationship between PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos should form a bedrock for policy decision-making. The result of the study might be an empirical dataset for policymakers and telecommunication companies' leaders in Nigeria to understand how systemic thinking relates directly to challenges confronting broadband penetration. The favorable social change implication for decision-makers and the citizens is that enhanced broadband Internet penetration translates to improved economic growth, poverty, unemployment, and social vices (Elebeke, 2019; Ogunfuwa, 2017). It is, therefore, necessary to review the empirical literature resources on broadband Internet.

Literature Review

Broadband Internet Services

BIS refers to the higher speed of Internet services provisioning that is different from the traditional Internet speed or the narrowband (Falch & Iaskio, 2019). Scholars unanimously agreed that broadband is a crucial success driver of the twenty-first-century information age as electricity was to the industrial era (Hanif et al., 2018; Kelly & Rossotto, 2012; Olaide et al., 2017). Jayakar (2018) argued that any nation that ignores

the current revolution of ICT would find it difficult to cope with global activities and trends. However, despite the worldwide acceptability and promotion of broadband by industry leaders, policymakers, and network operators, it has been difficult to agree on a single widely accepted definition of broadband. A review of current literature resources on broadband indicates a gross dimension of relativity in the broadband definition across spheres.

Kelly and Rossotto (2012) did a comprehensive review of broadband definition by approaching it from multiple trajectories. The author suggests that broadband definition should encapsulate the various aspects of the network and services: (i) infrastructure, pipe, or the medium of delivering services to the end-users. (ii) high-speed access to the Internet, and (iii) the services and applications available via broadband networks. Such services are; Internet protocol television (IPTV), video and movie streaming, Internet, and voice services bundled as a triple-play package. Agiwal et al. (2019) also aligned their thoughts with Kelly and Rossoto. Further, they suggested that broadband definition is country-dependent and that most states define broadband based on the speed of transmission megabits and kilobits per second. The scholars also noted that other countries represent broadband based on the types of services and applications.

Despite the wide range acceptability of broadband definition based on transmission speed, several scholars thought otherwise. Falch and Iaskio (2019) observed that broadband report based on rate presents some limitations. The authors argued that speed definition varies among countries with a generic categorization of the base download speed to be 256 kbit/s. The scholars cited India, South Africa, the ITU, and the

Organization for Economic Co-operation and Development (OECD) as examples of countries with the minimum download speed broadband definition (Falch & Iaskio, 2019). In contrast, countries like Canada have a high broadband base speed definition of 1.5 Mbit/s (ITU, 2017).

Falch and Iaskio also extended their argument that broadband definition referencing transmission speed may be unsustainable amidst rapid technological advancement (Falch & Iaskio, 2019). The same services and applications that determine broadband speed could change with the technological revolution, prompting broadband re-definition. Therefore, it is safe to conclude that what represents high-speed today may not necessarily be high-speed tomorrow. Therefore, any speed-based definition of broadband may need frequent updates as technology changes.

The identified limitations were why Brazil and some international organizations like the OECD suggested that stakeholders define broadband and transmission speed and functionality in terms of data type, activities, and connectivity type (ITU, 2017).

However, Hanif et al. (2018) argued that broadband definition based on only functionality limits the term and makes it overly subjective. The scholars summarized that broadband definitions that referenced the speed of connectivity and transmission make it easy to apply and operationalize. If a country defines broadband to have a transmission speed of 1.5 Mbit/s, it is easy to classify 2 Mbit/s connection as broadband while 1 Mbit/s as nonbroadband speed. As opposed to a definition based on functionality, it is difficult for a user to tell a more functional system than another user. The relativity of

individual experiences becomes an object of controversy, making it difficult to have a standardized industry stance on what should or should not be broadband.

The debate about a generally acceptable definition of broadband continues as there are scholars and practitioners. However, for this study, I decided to align my thought with that of Kelly and Rossotto (2012) and Hanif et al. (2018) to view broadband more holistically from the perspective of high-capacity information and communication technology (ICT). BIS is a platform that improves the value of communication services and applications that providers offer to transform lives and economies positively. The Presidential Committee on Broadband (2013) defines broadband as the enabler that can potentially influence the entire economy by changing its multiple and critical sectors. Kelly and Rossotto (2012) concluded broadband definition by aligning their thought with Jayakar (2018) to view broadband as an ecosystem with both the supply side (network platforms) and the demand side (development of services and applications, e-government, and promotion of broadband users). Policymakers encourage broadband penetration to positively transform the critical sectors of the economy, such as health, education, energy, commercial, and transportation.

Broadband Penetration Rate and Gross Domestic Product

Given the proper policy measures, broadband is a transformative platform that affects the ICT sector and the other critical sectors (Ogbo et al., 2018). The World Bank, in its 2010 report, sets an acceptable Internet global penetration rate of "76.2% for every 100 persons" (Kelly & Rossotto, 2012, p. 5), but with a population of over 200 million people (World Population Review, 2019), Nigerian broadband penetration hovers around

33% (Communication Week, 2019; Onwuaso, 2019). The Bank posits that the collective GDP of the West African region could increase by US$2 trillion in addition to the creation of more than 140 million jobs. The World Bank projection was for 75% of the population in the developing nations to have access to broadband Internet up from the present 35%. (World Bank, 2020a, 2020b, 2020c). The Bank, however, noted that there huge challenges to expanding broadband Internet into the rural communities in developing countries.

Developing countries have suffered decay in general infrastructure deployment, and broadband is not in isolation. Ogbo et al.'s (2018) article on broadband speed as a barrier to Internet use in rural communities examines mobile infrastructure and Internet use habits in urban and rural areas in Nigeria as one of the world's developing economies. The authors were concerned with how developing countries face unique challenges in addressing digital inequality and low broadband penetration. Umeh (2019) argued that broadband Internet's impact on developing economies is an excellent justification for driving the right amount of broadband penetration affecting the country's GDP.

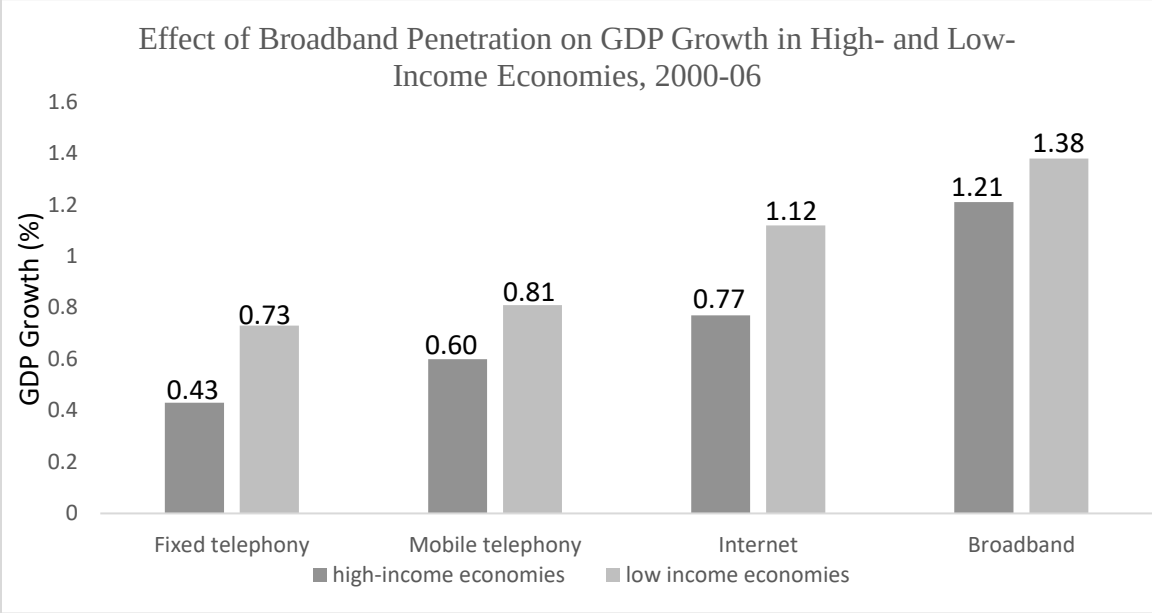
Different scholars have established that broadband has potentially wide-ranging impacts on access to information that increases efficiencies and productivity (Kelly & Rossotto, 2012; Ogbo et al., 2018; Olaide et al., 2017; Townsend et al., 2015; Umezuruike et al., 2015; Urama & Ogbu, 2018). Imasheva and Kramin (2020) conducted a world bank study to unravel the economic impact of broadband Internet across different nations. The scholars found that a 10% increase in broadband penetration accounted for

the 3% increase in the European countries' GDP between 2003 and 2006. Imasheva and Kramin also aligned their findings with the world bank research of 186 countries.

The conclusion was that for the countries with relatively high income, a 10% increase in broadband penetration triggers a corresponding increase of 1.21% in the GDP. The GDP growth was by 1.38% for every 10% increase in broadband penetration (Camba & Camba, 2020; Lederman & Zouaidi, 2020; World Bank, 2020c). Other Camba and Camba (2020) further reiterated that 10% in broadband household penetration boosts the country's GDP by 0.1% ranging to 1.4%. Different countries embracing technology cannot overemphasize the benefits of broadband to the GDP growth of the country.

Figure 2

Effect Broadband Internet Penetration on GDP Growth in High- and Low-Income Economies, 2000-2006

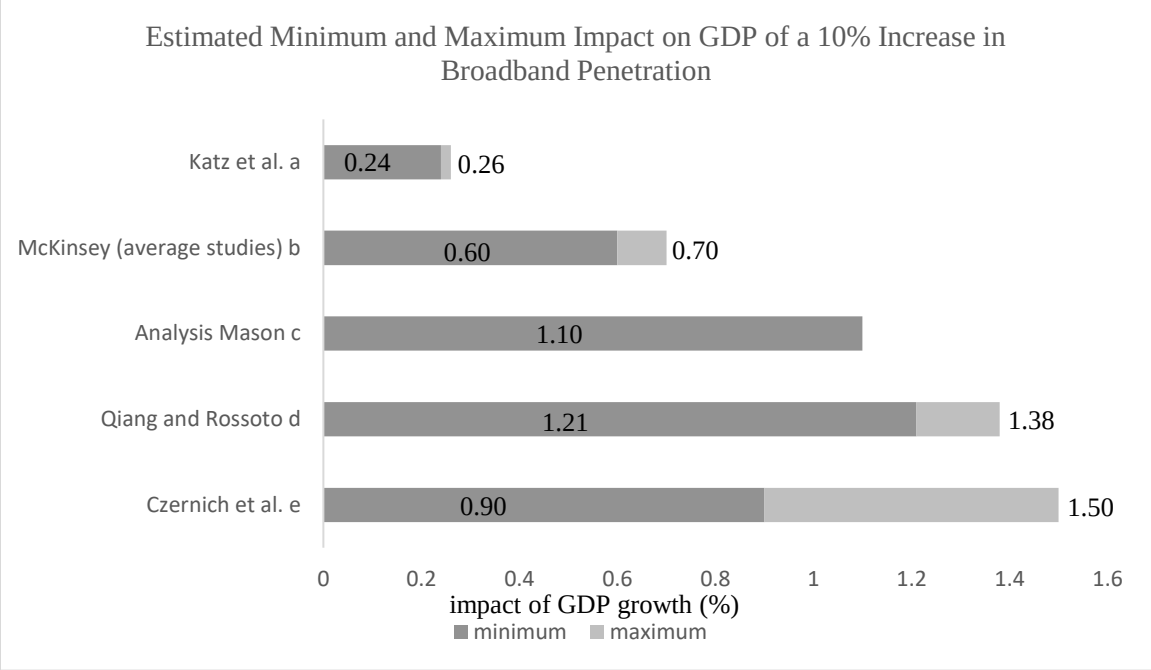


Adapted from the *Broadband Strategies Handbook,* by T. Kelly, & C. M. Rossotto, 2012, p. 6. Copyright 2012 by the World Bank Publication.

It is pertinent to say that despite the position of different scholars on the positive impact of broadband on economic growth, there has been a revealing magnitude in the estimate of the minimum and maximum effects (Kelly & Rossotto, 2012). For instance, scholars have estimated that a 10% increase in broadband penetration has a corresponding potential growth in the GDP of high-income countries from a minimum of 0.24% to a maximum of 1.50% for low-income countries, as demonstrated in figure 3.

Figure 3

Estimated Minimum and Maximum Impact on GDP of a 10% Increase in Broadband Penetration



Adapted from the *Broadband Strategies Handbook* by T. Kelly, T., & C. M. Rossotto, 2012, p. 7. Copyright 2012 by the World Bank Publication.

Legends

a. Only Germany

b. Average of five countries studies: Australia, the Arab Republic of Egypt, Malaysia, New Zealand, and the United Kingdom.

c. It is limited to mobile broadband impact in India.

d. Various countries. The upper range applies to developing countries, and the lower content applies to developed countries.

e. Sample of 20 OECD

The implication is that countries with low broadband penetration tend to lose the benefit of possible economic growth and development that should have improved through increased GDP (Imasheva & Kramin, 2020). The broader consequence is inadequate health care, a high rate of unemployment, an underdeveloped transport system, a weak education system, a high percentage of poverty, and increased social vices (Ogunfuwa, 2017; Okeke, 2020; Townsend et al., 2015). Ogbo et al. (2018) also observed that the identified problems of low broadband penetration are the reason for the aggressive pursuit of broadband deployment as a critical success factor to the achievement of the digital economy in the developing nations of the world. The scholar's thoughts align with the graphical analyses in figures 2 and 3, depicting that the developing countries stand to gain more economically if they pursue the right broadband deployment goal.

Strategies for the Deployment of Broadband Internet

Broadband Internet deployment is a crucial building block and fundamental to broadband-related studies and the associated benefits. Dawadi et al. (2020) conducted exploratory qualitative research on affordable broadband with a software defined IPv6 network for developing rural communities. The authors found that broadband infrastructure deployment helps rural and urban communities of developing communities to achieve an intelligent community target and natural transformation to emerging economies. Dawadi et al. (2020) cited Nepal as one of the developing countries that broadband deployment has transformed.

Understanding broadband Internet deployment requires a cursory hierarchical analysis of the implementation of high-speed connectivity infrastructure from

international, national, and metropolitan dimensions (Gu et al., 2019). The authors suggested that deliberate deployment strategies must support future optical communication technology. Imasheva and Kramin (2020) also aligned their thought on the need for a reliable infrastructure that combines the traditional characteristics of network nodes working together for proper functionality.

Kelly and Rossotto (2012) also aligned with Dawadi et al. (2020) and Wiley (2006) to categorize the broadband deployment hierarchical model into a supply chain of international connectivity, national backbone networks, metropolitan access links, and local access networks. It is important to note that this study is about the local access networks' hierarchical model and the resistance that network operators face from the community members and leaders during broadband Internet deployment. It is, however, essential to encapsulate the broadband hierarchical deployment models into a series of strategies.

International Broadband Connectivity Infrastructure

International connectivity is a broadband infrastructure deployment that connects international boundaries between countries (Naeem et al., 2019). Naeem et al. (2019) also noted that IBCI has only two infrastructural deployment types; fiber optics and satellite. But Kelly and Rossotto (2012) observed that IBCI requires lots of intelligence to manage and route Internet traffic. The authors concluded that the structure of IBCI is predominantly undersea, making it difficult for fault tracing, fixing, and regular maintenance. Other respected scholars and knowledge experts also confirmed that the regulation behind the deployment and operation of IBCI supports the claim for

intelligence handling (Queder, 2020). IBCI, also known and described by other scholars as wet-segment connectivity, is the medium for international Internet traffic that provides direct feed to the national backbone network.

National Backbone Network Infrastructure

The international traffic from IBCI has no use without the NBNI. The NBNI represents the pathway or infrastructure by which connectivity operators transmit data across and within the country (Dawadi et al., 2020; Kelly & Rossotto, 2012; Naeem et al., 2019). Queder (2020) NBNI functions optimally when public policymakers interEndcovene to positively affect the profitability of a wholesale-only business model that will be willing to deploy the infrastructure on behalf of the other operators. Ruffini et al. (2020) observed that the NBNI deployment regulation differs across countries. The authors noted state authorities give operators with the most influential national presence and market share the benefit of building the NBNI Europe.

Whereas in the US, the government decided not to enforce the act. Private power individuals handled the NBNI deployment in phases rather than state funded. Wang and Dang (2019) disagreed with Ruffini et al.'s (2020) by arguing that the government should handle such massive infrastructure deployment since the government understands the criticality and can wait for decades for returns. Kelly and Rossotto (2012) opined that the media for the NBNI transmission is microwave, satellite, and fiber optics. The authors summarized that the NBNI provides a handshake for Internet exchanges, metropolitan rings, and next-generation networks (NGNs) (Kelly & Rossotto, 2012). The NBNI is a

feeder into the metro links and the local area networks serving as last-mile connectivity infrastructure.

Metropolitan Access Infrastructure

The MAI is the terminating point for the NBNI and provides a bridge between the NBNI and the local access infrastructure. Kelly and Rossotto (2012) noted that the media connecting the MAIs is microwave, fiber optics, and to some extent, satellite. Imasheva and Kramin (2020) observed that the MAI is as vital as the IBCI and the NBNI. The authors argued that without a functioning MAI, the data, and the Internet bandwidth available on the IBCI and the NBNI could not get to the intended user. The MAI's distribution capacity has become a subject of debate across regional regulatory agencies, including the international telecommunication union (ITU, 2017).

Kani et al. (2020) did a comprehensive analysis in their article “Future optical access network-enabled by modularization and softwarization of access and transmission functions.” The authors advised that governments across countries should work at providing enabling and secure environments for MAI deployment. The scholar suggested that the government assume full ownership of MAI and other telecommunication infrastructures by categorizing them as critical national infrastructures like roads and electricity. Operators interconnect the MAI using backhaul links of either fiber optics or microwave links. The MAI is the aggregation point for all user traffic from the local access network infrastructure.

Local Access Network Infrastructure

The LANI architecture is a structural cable arrangement or wireless connectivity that provides a direct medium for the end-user to connect and use broadband services (Agiwal et al., 2019; Camba & Camba, 2020; Chanclou et al., 2020; Kelly & Rossotto, 2012). Operators set up the LANI for ease of management and control of broadband Internet users. Chanclou et al. (2020) advised that the LANI deployment should deliver the best user experience and quality to support the other levels of the hierarchical broadband model. The user experience at the LANI stage determines whether the entire investment in the broadband deployment hierarchical model value chain is justified. It is safe to conclude that the LANI is not less important than the other stages of the model.

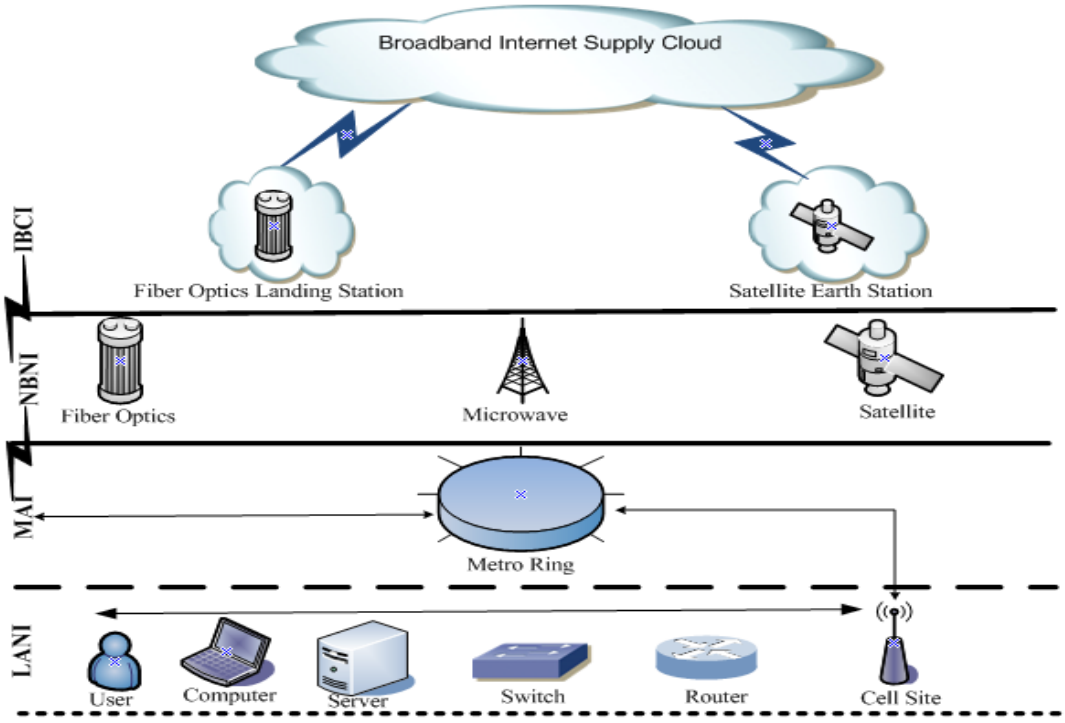
A critical point to note in the strategy for the deployment of broadband Internet discourse is the systemic nature of understanding network nodes and integrating the various essential nodes that facilitate the traffic flow. Dawadi et al. (2020) opined that the strategy for BIID at different levels has no definite boundary separation. The authors argued that Internet traffic exchanges route domestic traffic at the national deployment level. However, the same exchanges also handle international traffic as peering points for the overseas network.

Dewadi et al. also argued that domestic traffic stays within the country. At the same time, the metro backhauls serve to bridge the local access networks to the mainstream broadband traffic cloud (Dawadi et al., 2020). I have depicted the overwhelming synchronization between the broadband network infrastructural deployment at different levels. It reiterates the significance of any form of disruption,

vandalization, or outright resistance to broadband infrastructure deployment. The specific problem is that community members and leaders have BI to allow BIID at the local community level in Lagos. (Adepetun, 2019; Onwuaso, 2019). The hierarchical broadband model in figure 4 depicts the different levels of broadband Internet deployment up to the users in the community.

Figure 4

The Hierarchical Model of Broadband Internet Infrastructure Deployment



Broadband Versus Narrowband Internet

Broadband Internet is the focal point of this study. However, the argument between Hanif et al. (2018) and Falch and Iaskio (2019) further establishes a good comparison between broadband Internet and narrowband Internet to clarify general

perception on the terms. The researcher intends to build on the scholars' argument to create the necessary connections and distinctive characteristics of broadband and narrowband. Queder's (2020) opinion that broadband occupies a central position as a tool facilitating the ease of doing business is no longer a discussion subject. Ruffini et al. (2020) argued that broadband enables the transmission of multi-service operations in the right multi-tenant environment. The authors observed that Hanif et al. (2018) also noted that broadband's previously mentioned features also enhance the effectiveness of applications, implementation of faster speeds, graphical interfaces, and higher interactivity and performance. All of which require much higher bandwidth than does the simple transmission of plain text alone. It is noteworthy that broadband enables the efficiency of triple-pay services.

However, narrowband is in the category of dial-up connection can only be used for either voice or data at a time (Agiwal et al., 2019). Narrowband refers to low-speed communication services of a lower rate for low data application services (Hiben et al., 2019). Some authors defined narrowband in its purest form as communication services that use a narrower frequency than broadband (Agiwal et al., 2019; Švigelj et al., 2019). Table 1 gives more detail on the comparison between broadband and narrowband.

Table 1

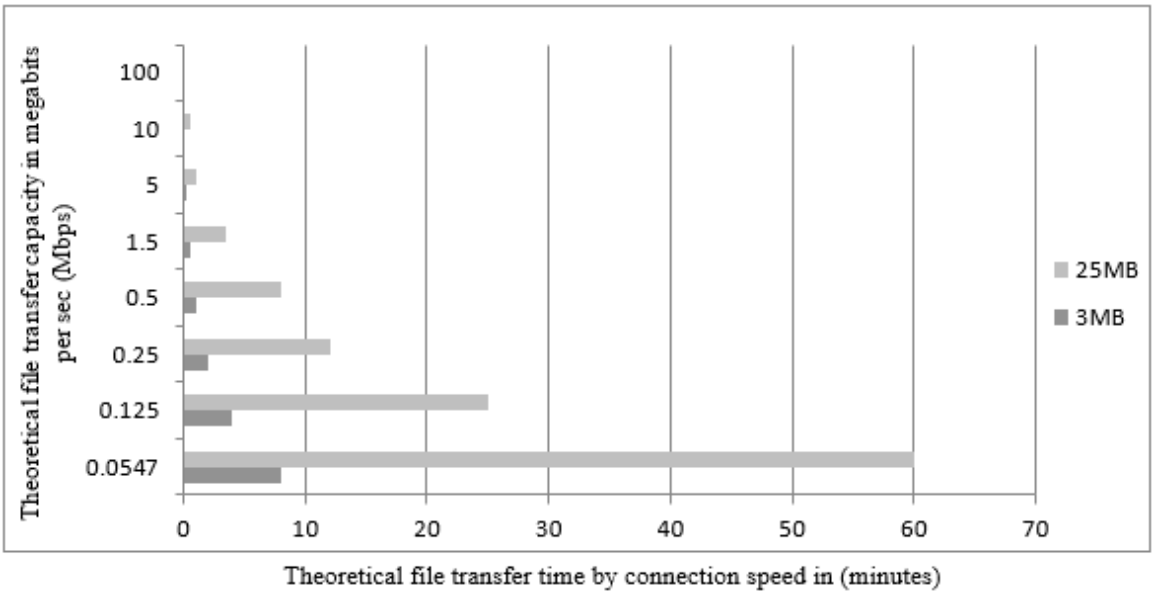
Comparison Between Broadband and Narrowband Internet

Features	Narrowband	Broadband)
Speed	Up to 56kbps	More than 256kbps
Switching	Circuit switching	Mainly Packet switching
Connection method	Dial-up	Always on; ADSL, Cable, Mobile
Available services	Voice, low-rate data	Voice, data streaming video

Note. From "Are Internet users in Slovenia willing to pay for fast broadband and what drives them to migrate?". By Švigelj et al. (2019, p. 1005), Economic research-Ekonomska istraživanja, 32(1), 1001-1018.

Figure 5

Connection Speed for Narrowband and Broadband Internet



Note from "Are Internet users in Slovenia willing to pay for fast broadband and what drives them to migrate?". By Švigelj et al. (2019, p. 1004), Economic research-Ekonomska istraživanja, 32(1), 1001-1018.

Table 1 and figure 5 show Švigelj et al. (2019) summaries of broadband and narrowband Internet speed comparison discussion. In figure 5, the Y-axis represents theoretical file transfer capacity in megabits per second, while the X-axis represents academic file transfer time in minutes. I consider two different capacity types (3Mbp/s and 25Mbp/s) and depicted with dark grey and grey colors. The dark grey color represents a lower capacity (3Mbps), while the grey color shows a higher bandwidth (25Mbp/s). Notice that at 56kbps - 0.0547Mbps (narrowband speed), it takes 60 minutes to transmit 25Mbp/s data and 8 minutes to transfer as low as 3Mbp/s data. Whereas, at

256kbs - 0.25Mbps/s (broadband speed) and above, data transmission time reduces immensely even as broadband capacity increases (Cook et al., 2019; Švigelj et al., 2019).

Cook et al. (2019) argued that broadband Internet could ignite developmental processes at different levels because of the advantage of high data multiple application transmit speed. Broadband offers individuals' subscribers improved educational opportunities, entertainment diversity, and improved access to peers, information, and local area networking options than narrowband (Švigelj et al., 2019). Broadband offers improved efficiency, branch office connectivity, and access to operation-specific applications that enhance new business experiences (Cook et al., 2019). "Broadband is to the 21st-century information age what electricity was to the industrial age" (Presidential Committee on Broadband, 2013, p. 13).

Queder (2020) argued that the transformative effect of broadband Internet on nations and the global economy in the coming years is better imagined. The transition from narrowband Internet to broadband Internet was a necessary revolution that changed the way people do business and live in the twenty-first century. Presidential Committee on Broadband (2013) warned that nations should strive to be part of the new age's digital transformation.

Nigeria Historical Summary (Research Setting)

Nigeria is one of the countries in the African continent, precisely in West Africa, and officially addressed as the Federal Republic of Nigeria (FRN) (Wang & Dang, 2019). Nigeria harbors the highest number of black populations in a geographical location and is the most populous country in Africa, with a population figure of over 200 million people

(National Bureau of Statistics, 2020c; World Population Review, 2019; Youthhub Africa, 2020). In another survey, Worldometer (2020) ranked Nigeria as the seventh most populous country globally and estimated that Nigeria would be the third most populous by 2050 with an estimated population figure of over 400 million.

The United States Embassy in Nigeria's (2018) facts check revealed that Nigeria accounts for over half of West Africa's population. The study showed that 250 multi-ethnic groups speak more than 4000 dialects across 774 local government areas making the country giant in the sub-region. Nigeria shares a geographical boundary with Niger in the north, Chad in the northeast, Cameroon in the east, and Benin in the west (The Commonwealth, n.d.; Wilson & Idoniboy-Obu, 2019). Nigeria was colonized by the British and formally became an independent federation in 1960 (World Bank, 2020b). The country is also culturally diverse, with 36 autonomous states and Abuja as Federal Capital Territory and multi-ethnic groups (Ng'weno, 2020; Okonkwo, 2020). Nigeria is blessed demographically and geographically and with the right combination of natural resources for the economic prospect.

World Bank (2020c) global economic prospect report noted Nigeria as Africa’s biggest oil exporter with the most abundant gas reserve and other natural resources in abundance. However, scholars have argued that rather than the population, size, and economic affluence translates to better living standards, the citizens of Nigeria plunged into abject poverty and woe (Dosumu et al., 2020; National Bureau of Statistics, 2020a). The most recent poverty clock report shows that Nigeria has to overtake India in the

power rating index figure (Quartz Africa, 2018). The organization reported that Nigeria has more citizens living in extreme poverty as of June 2018 (Quartz Africa, 2018).

Quartz Africa (2018) found that 86.9 million Nigerians representing 46.7%, live in extreme poverty over India's 71.5 million people (5.2%) living in extreme poverty. The National Social Safety Nets Coordinating Office – NASSCO (2020) and the World Bank (2020c) directly aligned with the Quartz Africa (2018) study with a suggestion that policymakers in Nigeria should work hard to implement the content of the United Nation's sustainable development goal to end extreme poverty by 2030.

The weak human capital and human development index rating also explain the inadequate education system in the country. Youthhub Africa (2020) conducted experimental survey research to understand what the government is doing to reform primary education in Nigeria. The organization found that 13.2 million children in Nigeria are out of school. The study also revealed that 69% of school-age out-of-school children are from the northern part of the country.

National Social Safety Nets Coordinating Office – NASSCO (2020) blamed the situation on the reduced household income. In a survey conducted in January 2020, NASSCO found that 9.45 million Nigerians living in extreme poverty were from 2.25 million poor and vulnerable households. The study revealed that the identified families could not provide primary education to school-age children. NASSCO's finding of poverty-ravaging families in Nigeria aligned with the National Bureau of Statistics (2020a) data that relates to the high level of poverty in the country to the increased unemployment rate of 23.1% and youth unemployment and underemployment rate of

55.4%. The World Bank (2020c) report linked Nigeria's economic situation and the increased household poverty to the high unemployment rate.

The implication of the proposed study to Nigeria's economic situation is that its annual 2019 overall actual GDP stands at 2.27% (National Bureau of Statistics, 2020b). The Nigerian policymakers and economic managers are working assiduously to keep improving the country's annual GDP. Camba and Camba (2020) and Lederman and Zouaidi (2020) all agreed with Kelly and Rossotto (2012) that the developing economies of the world could increase GDP growth by 1.38% for every 10% increase in broadband penetration. Therefore, the proposed study is necessary to establish a possible relationship between complexity thinking factors of PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos.

Broadband Internet Penetration in Nigeria

There seems to be an emerging problem in the developing countries of the world, especially Nigeria. A world bank population review puts the countries current population figure at over 200 million people (World Population Review, 2019). Scholars and industry practitioners in the Nigerian telecommunication industry set the broadband penetration index at slightly over 33% (Communication Week, 2019; Onwuaso, 2019). Some industry actors thought that the 33% industry rating for broadband penetration could be wrong because of the computational model that the regulator applied (Communication Week, 2019; Odunsi, 2020; Ogunfuwa, 2017; Teniola, 2017).

Communication Week (2019) observed that the regulator counted the 100 million active lines used for data traffic to translate to the 33% broadband penetration rate.

Experts described the Nigerian broadband Internet penetration rate as low. Onwuebuchi (2019) revealed Nigeria's value and other mobile economies as over $50Bn in 2018. The author cited research by the global system for mobile communication association (GSMA) to conclude that the West African mobile ecosystem generated $50 billion in economic value in 2018. The worth of the sub-regions mobile market might hit $70 billion by 2023. Therefore, the report underlines the vital role of mobile telephony and broadband in West Africa, leveraging the region's growing population.

Nigeria is aware of broadband benefits, and it is working hard to improve the penetration index despite the enormous challenges. Onwuaso (2019) observed that the regulator (NCC) is concerned and decided to consider a collaborative effort with some telecommunication infrastructure providers. The report underlines the regulator's planned empowerment of the InfraCos to commence operation in Nigeria. Onwuaso (2019) reported that EVC, Prof. Umar Danbatta, has planned to disburse take-off grants as subsidies to the InfraCos to facilitate broadband infrastructure. NCC noted that the gesture would boost broadband penetration and make it pervasive nationwide. Onwuaso found that the regulator intends to intervene by injecting some funds as an agreed percentage to the already discussed required capital expenditure (CapEx) with the InfrasCos.

In a related study on Onwuebuchi (2019), there is a need for immediate investment in BIID to cater to Nigerians' digital needs. The overall Internet-aware customers in Nigeria increased to 114,725,357 in February 2019 from 113,875,204 figures of January 2019, showing an increase of 850,153 new subscribers. The report

indicates that the broadband Internet knowledge of Nigerians has increased more than before to justify the need for fixed investment in broadband infrastructure.

The Nigerian telecommunications industry practitioners are working across the board to ensure that the country achieves a comfortable broadband penetration rate in line with the country's population growth rate. Communication Week (2019) reported that the NCC targets 70 Percent Broadband Penetration by 2024. The organization conducted a qualitative investigation through a face-to-face interview and found that NCC has provided voice services to 174 million Nigerians as of February 2019. The report indicates that 100 million people out of the published statistics use data traffic to translate to the current 33% broadband penetration rate.

Communication Week (2019) Projected a positive outlook if the operators in the industry embark on massive network expansion services. Townsend et al. (2015) argued that only a deliberate broadband expansion strategy could extend the benefits to the people irrespective of location. The scholars adopted qualitative in-depth semi-structured interviews with 15 rural practitioners across four different skills in Scotland, United Kingdom. Townsend et al. (2015) found that broadband access and use can impact rural business owners and contribute to the sustainability of life in remote rural areas. Policymakers in Nigeria must continue the aggressive drive towards achieving the projected broadband penetration rate.

In a bid to identify the challenges of low broadband penetration in Nigeria, Ogunfuwa (2017) and Teniola (2017) cited several TFs like agency regulation, multiple taxations, tense political environment, inadequate budgetary provision, poor

infrastructure, and more as factors responsible for the low broadband penetration. The scholars might have a valid observation despite the various interventions by the Nigerian government in the past. Still, Adepetun (2019) cited examples and provided enough evidence that the government has sometimes addressed the identified broadband development deficit, but the situation remained unchanged.

Challenges of Broadband in Nigeria

Reflecting on the benefits of broadband, the Federal Government Team, stakeholders, and scholars identified numerous challenges confronting broadband penetration in Nigeria. Nwankwo (2018) noted some difficulties as the high costs of the right of way and the high price of leasing transmission infrastructure. Others are; long delays in the processing of permits, multiple taxations at Federal, State, and Local Government levels (Olaide et al., 2017).

Presidential Committee on Broadband (2013) worried that one of the factors affecting broadband development in Nigeria is that network operators deal with multiple regulatory bodies and suffer damage to existing fiber infrastructure. More so, scholars and industry actors identified more significant challenges of cable theft, road works, and other operations, and the lack of reliable, clean grid electricity supply (Olaide et al., 2017; Presidential Committee on Broadband, 2013; Teniola, 2017; Umezuruike et al., 2015). Leaders and policymakers in the telecommunication industry continue to talk about the industry's challenges and charge the government to intervene urgently. Government intervention might not come so quickly as expected for all cited cases, but there seems to be no significant improvement. The proposed study seeks to investigate a possible

relationship between the complexity thinking factors of PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos.

In a paper presented at the BusinessDay media broadband summit in 2017, the president of the association of telecommunication companies of Nigeria (ATCON), Olusola Teniola, argued that the industry is suffering from severe challenges of unfair industry completion. These multiple forex windows create uncertainty, lack of infrastructure sharing policy (Teniola, 2017). Teniola also revealed low coverage of 3G networks across all parts of Nigeria and high inflation, discouraging small and medium enterprises from playing in the telecoms space. Identifying the real challenge of Nigeria's broadband Internet penetration rate has become an imperative and researchable problem. It might be worth research because identifying and fixing the past problem did not yield a positive result.

Abang (2016) and Elebeke (2019) elevated the discussion beyond the traditional knowledge on broadband issues. The authors aligned with the notion that the world's developing nations need to do more to improve broadband penetration. The scholars noted that the developed economies had made significant process by setting the right machinery in motion to enable broadband Internet development and strengthen its penetration. However, Nigeria, as an essential country in Sub-Saharan Africa, is still low in broadband penetration.

The NCC (2018) admitted that there is an obvious need to bridge the digital divide as a matter of emergency. Akwaja (2019) captured the regulator's thought ideally

in a newspaper published on the unveiling of the broadband plan in Nigeria. The author presented a detailed plan by the EVC of the NCC at the 10th edition of the eWorld forum and awards. Akwaja found that the EVC noted the poor state of broadband Internet in Nigeria and revealed that the regulator would provide a framework that encourages competition and innovation to generate investment and benefits. Akwaja summarized that the regulator had an overall strategy to promote investment, strengthen connectivity, and convergence to improve the broadband penetration rate in Nigeria.

The Nigerian regulator might be worried about the condition of the broadband Internet in the country and noted that it could not achieve the required penetration index unless the federal government addresses specific underlying infrastructural deficits and broadband dependencies. Onwuaso (2019) blames the epileptic power supply for the country's poor quality of broadband Internet service. The author conducted a qualitative research interview to establish a relationship between broadband Internet penetration and the dilapidated condition of the national power supply.

Other scholars disagree slightly with Onwuaso (2019) by considering different factors responsible for the low broadband rate in Nigeria. Agbata (2019) argued that the problem of broadband development in Nigeria is policy inconsistency. The author observed that policymakers and leaders in Nigeria formulate sound policies and laws enough to grow every sector of the economy but lack the political and moral will to execute the strategies. The provisions of the Nigerian local content act could help stabilize the Nigerian local content act on information and communication technology (ICT) (Agbata, 2019). The scholar concluded that such efforts would preserve policies

affecting the Nigerian telecommunication industry's growth and promote broadband Internet development.

Another scholar that took a different stance on the factors affecting broadband Internet penetration in Nigeria was Adepetun (2019). The researcher adopted a quantitative study approach to investigate the role of state agents and community leaders on broadband infrastructure development. The author argued that the government and other state agents halt the progress of broadband Internet in the country through its policy. Adepetun (2019) observed that state government, community leaders, and members shut down the network operator's infrastructure indiscriminately.

In a related study, Aworinde (2019) noted with concern that the Nigerian civil aviation authority (NCAA) demolished 8,805 telecommunication tower infrastructures for alleged violation of NCAA regulations without recourse to the implication on the quality of service to the users of the Internet services and critical connections. The demolition affected the country's Internet speed to the extent that there was a considerable drop in the Internet speed experience compared with other developing nations. Adepetun and Areo (2019) examined the Internet speed experience between Nigeria and other developing economies and found that Nigeria ranked 177th out of 207 countries measured worldwide.

Bolden et al. (2020) advocated for a change in the orientation of public servants in support of a digitally driven economy. The authors argued that leaders who understand the impact of technology on the economy's growth should occupy public offices rather than destroying the infrastructure. Bolden et al.'s (2020) study seems to align with

Adepetun's (2019) publication on whether state actors and community leaders should support fiber and other telecommunication infrastructure expansion or not. The report examines the role of state leaders and local communities in support of fiber infrastructure deployment in the local communities. Adepetun (2019) found that the leadership in the states and the rural communities can play a significant role in the development or otherwise of the fiber infrastructure deployment.

Adepetun’s finding implies that technological development depends on acceptability, culture, and the environment. Studies have shown that socio-economic factors and environmental dynamism affect the growth and success of businesses at different levels, especially small and medium enterprises. Saleem (2017) conducted a critical examination of the chief determinants of small-scale business success in Pakistan's Dera Ismail Khan district. Saleem (2017) embarked on quantitative research by collecting data from 60 randomly selected respondents and administering structured questionnaires. The scholar used regression techniques to analyze the data. Saleem (2017) found a significant and positive impact on the environmental factors of investment, entrepreneurial experience, business profile, and culture on the success of businesses. The specific problem is that community members’ and leaders’ BI allow BIID at the local community level in Lagos (Adepetun, 2019; Onwuaso, 2019). Thus, the need to investigate how the complexity thinking factors of PU, PB, PEoU, PS relate to the BI of the community members and broadband infrastructure deployment.

Complexity Thinking

Complexity thinking comes from the understanding of complexity theory and complex adaptive systems. Uhl-Bien and Marion (2008) embarked on a ground-breaking exploration of complexity leadership and established that it is a necessary tool for the survival of the twenty-first-century leader. Complexity theory is a unique field of study for organizational behavior and raises an immediate need for dynamic adaptability among today's leaders (Hallo et al., 2020; Hoogeboom & Wilderom, 2020; Mamédio & Meyer, 2020).

Complexity thinking presents a unique perspective of knowledge and challenges the well-known reductionist notion of predictability, planning, and coordination. Scholars argued that complexity theory and thinking reduces attention to strategic thinking, making it the preferred leadership skill of the new age (Galkina & Atkova, 2019; Greenhalgh, 2020; Mohammad et al., 2017; Zetting et al., 2020). Complexity thinking relates to this study as an independent variable. Therefore, I will explore the theoretical potentials of complexity thinking in leadership concerning its operationalization in this research.

Complexity theory gradually became a focal field of study for scholars of today's increasingly unpredictable world. But Tourish (2019) argued that researchers have not been able to apply it correctly to leadership study despite its popularity. The author found that complexity theory intensifies influences on the theoretical potentials in the field of leadership studies. The importance practitioners attached to the knowledge of complexity theory is related to its impact on leadership studies. Greenhalgh (2020) and Uhl-Bien and

Marion (2008) agreed that complex organizational behavior characteristics are nonlinear. Also, emergent change interaction and interdependency. Others are unpredictability, autocatalytic behavior, and dynamic movement.

Tourish (2019) also has an aligned thought about the concept of complexity. The author concluded that “complexity is the scientific study of systems with many interacting parts that exhibit a global behavior no reducible to the interaction between the individual constituent parts" (Tourish, 2019, p. 3). Leadership plays a huge role in enabling the conditions in which complex dynamics can emerge in complex systems. Therefore, complexity science contradicts general knowledge of how systems work (Galkina & Atkova, 2019; Zetting et al., 2020). Complexity contradicts the science of entropy and challenges western rationality that order is free. It is, therefore, paramount to understand some of its implications for leadership.

The Implication for Leadership

The twenty-first-century organizational environment possesses lots of uncertainty, making it increasingly difficult for leaders to predict organizational capability and operations. Nechkoska (2020) seems to have created a comfortable thought balance with Nechkoska (2020) that appears to have made a healthy thought balance with Uhl-Bien and Marion (2008) in pulling through some implications of complexity theory to leadership.

Complexity provides different perceptions and tools that enable leaders to understand and evaluate organizational behavior (Uhl-Bien & Marion, 2008). The three significant complexity observations are; 1. The interacting system agent does not require

coordination or input from external sources to create ordered behavior and structure (Nechkoska, 2020). 2. When systems become overly tensed or destabilized, they will suddenly release energy and create a new, typically unexpected order in the process (Uhl-Bien & Marion, 2008). 3. The future is difficult to predict. Therefore, the sophisticated predictive equation and strategic planning may not be necessary (Uhl-Bien & Marion, 2008). These three unique observations of complexity connote that complex interactions with other agents could influence the relationship between leaders and subordinates.

Mamédio and Meyer (2020) observed that complexity theory enables a new perspective in leadership practice as behavioral patterns, processes, and outcomes become inherently difficult to predict. The leader identifies definite causal relationships and establishes different ways of practicing leadership noting patterns that emerge from the adaptive interaction of many agents (Crowell & Boynton, 2020; Tourish, 2019).

Scholars from different spheres of life are keen to understand how complexity differs from other ways of understanding reality and how complex dynamics operate (Zetting et al., 2020). The primary leadership training espouses that personality and line of authority are the underlying ingredients of traditional leadership. However, complexity thinking deviates from this strand. That makes it difficult for today's leaders to re-orient it difficult for today's leaders to re-orient their thoughts to the new reality (Hallo et al., 2020).

It is essential to state that complexity is not a denial of the old tradition but an extension or a paradigm shift towards a new era of leadership. Uhl-Bien and Marion (2008) briefly described the reason for complexity theory in a sentence. The authors

opined that "just as quantum dynamics provided new lenses by which to understand Newtonian physics, complexity provides different perceptions and tools to understand and evaluate organizational behaviors" (Uhl-Bien & Marion, 2008, p. 2). The implication of complexity to the study of leadership is a driving force to leadership in complex systems.

Complexity Leadership

There has been a recent debate in the administration that organizational problems have become complicated, dynamic, and turbulent. The top-down strategy is now insufficient (Hallo et al., 2020; Mamédio & Meyer, 2020). The technological revolution has transformed the nature of the modern environment to hyper turbulent and rapidly changing such that traditional leadership skills and strategies no longer serve (Hoogeboom & Wilderom, 2020).

Complexity leadership skills help the leader to understand the nature of the global business environment and the interconnectedness that characterizes the interaction pattern. Uhl-Bien and Marion (2008) advocated for a leadership approach that is equipped with the necessary skills and knowledgebase to understand the dynamism of complex organizations and complex environments. Complexity leadership encapsulates a framework for leader behavior. Hallo et al. (2020) argued that the context triggers a complex mechanism that enables fast and efficient decision-making within a complex system. Mamédio and Meyer (2020) opine that complex mechanism activates emergent creativity, learning, and adaptability.

Another critical aspect of the complexity leadership discourse revolves around Mamédio and Meyer's (2020) observation, which aligns with Uhl-Bien and Marion's (2008) projections that complexity leadership tenets enable workable structure and regulated environment for seamless and flexible operations. The authors argued the knowledge of complexity leadership allows the leader to put the suitable systems to work and respond to effectively and rapidly catastrophic or opportunistic changes (Mamédio & Meyer, 2020; Uhl-Bien & Marion, 2008). The scholars further investigated what constitutes a valid and rapid response to catastrophic or opportunistic events. For instance, Mamédio and Meyer (2020) argued that state agents' reactions during the week of Katrina could not follow a preplanned guideline by the Federal Emergency Management Agency, which the leaders considered as impotent under the circumstances.

Responses to health emergencies, natural disasters, and life-threatening situations cannot be valid with structured traditional leadership institutions. Tourish (2019) also acknowledged that such conditions are overwhelming, complex, and fast-moving for conventional leadership practice. The author stressed that the most effective approach for such situations has often been a bottom-up approach that overrides all bureaucratic links to enable an adaptive and spontaneous response to immediate needs.

Complexity leadership frameworks encourage swarm behavior and order from messy processes (FreedomLab, 2010; Galkina & Atkova, 2019). There is a lot for leaders to learn from complex adaptive systems regarding adaptability and learning from chaos and messy processes. Margaret Wheatley (FreedomLab, 2010) observed that good leaders know that they cannot do it alone but trust others to be as creative and motivated as they

are. The researcher advised that leaders should have faith in people, letting go, and giving subordinates the resources and support to deliver on the job.

Complexity leadership theory is embedded with a network of emergence dynamics that produce adaptive dynamics and generates creative and adaptive knowledge (Hoogeboom & Wilderom, 2020). Uhl-Bien and Marion (2008) opined that adaptive leadership is not about the individual leader but the understanding of the dynamic of interdependent agents that generate change in the social system. The author described the scenario as network dynamics.

Uhl-Bien and Marion (2008) defined network dynamics as "the context and mechanisms that enable adaptive leadership (p. 202). The scholars used two concepts to create a perfect explanation of network dynamics. "Context" and "mechanism." The context is the interactive atmosphere where complex dynamics occur, while mechanisms represent behavioral patterns that produce difficult outcomes (Uhl-Bien & Marion, 2008). Therefore, adaptive leadership emerges within the two interactive and interdependent activities that some authors described as network emergence dynamics models (Crowell & Boynton, 2020; Tourish, 2019). The model better explains the context-mechanisms discourse in this paragraph.

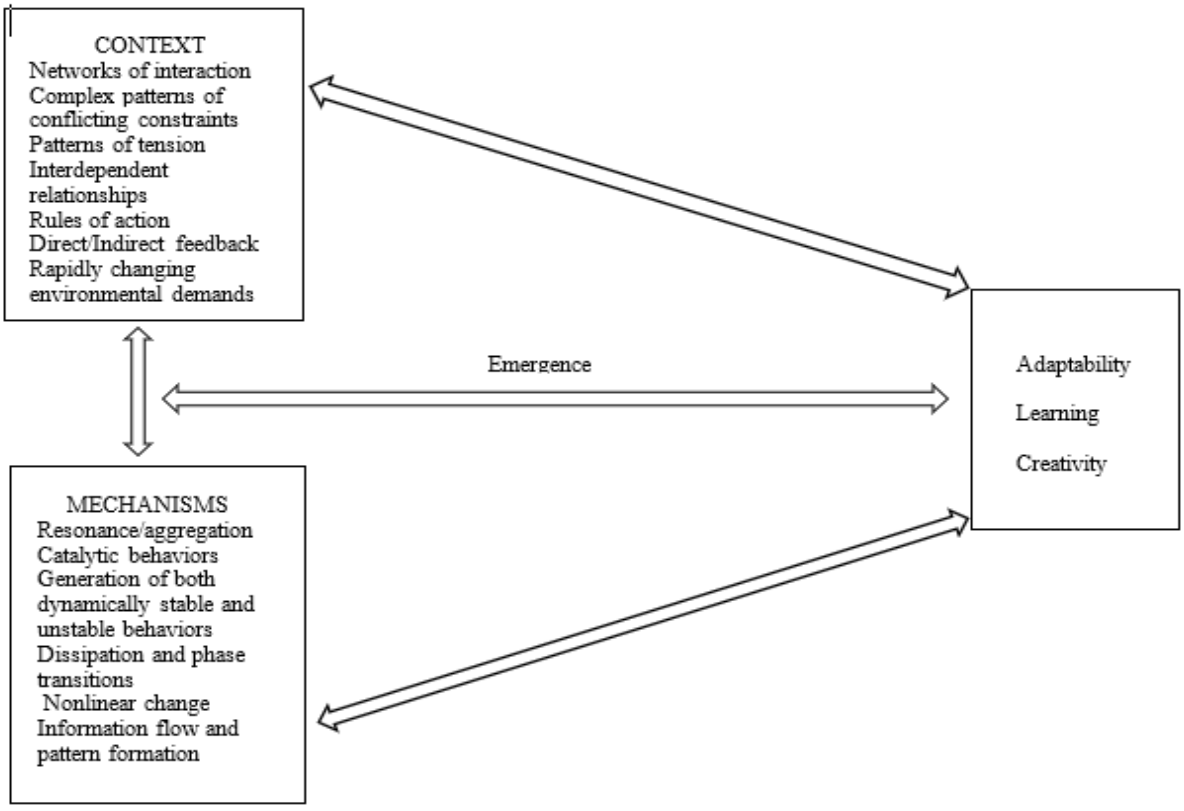
Figure 6 depicts a clear pattern of interaction of the network emergence dynamics of context and mechanisms. The settings shaping ideas include networks of interaction, complex patterns of conflicting constraints, patterns of tension, and interdependent relationships. Others are rules of action, direct and indirect feedback loops, and rapidly changing environmental demands (Uhl-Bien & Marion, 2008, p. 202). The emergent

mechanism from the context includes "resonance/aggregation of ideas, catalytic behaviors, generation of both dynamically stable and unstable behaviors. Dissipation of built-up tension as phase transitions, nonlinear change information flow, and pattern formation, and accreting nodes" (Uhl-Bien & Marion, 2008, p. 202). The model explains a perfect characteristic of emergent criteria in a complex network.

Hallo et al. (2020) observed that the emergent new ideas combined with divergent opinions and conflict resolution within the system resulting in adaptability, change, learning, and creativity are notable features of complexity leadership. It is, therefore, noble to conclude that complexity leadership allows for systemic thinking.

Figure 6

Network Emergence Dynamics Model



Note. From *Complexity leadership, Part 1: Conceptual foundations*, by Uhl-Bien, M., & Marion, R. (Eds.), p. 203, Information Age.

Systems Thinking

Complexity theorists dissipated an extraordinary amount of energy and spent quality time describing complex organizations related to complex adaptive systems (Tourish, 2019). Scholars interested in the field of complexity were emphatic that complexity leadership requires the leader to possess some essential qualities of

adaptability, learning, creativity, flexibility, agility, rapid response-ability, and complex mindset (Hallo et al., 2020; Hoogeboom & Wilderom, 2020; Uhl-Bien & Marion, 2008).

Leaders with complex mindsets need to understand the dynamic nature of the different elements in a system using the lenses of critical thinking skills (Meadows, 2008). This assertion is true because the "least obvious part of the system's function or purpose is often the most crucial determinant of the system's behavior" (Meadows, 2008, p. 16). Meadows's assertion aligns with that of Van Woensel (2020), who thought that disasters, whether natural or human-made, become devastating in effect because people ignore the least expected part of the system.

Organizational leaders prefer to see and discuss the bigger picture in decision-making but ignore the whole element. Salmon and Read (2019) struck a harmonious balance with Oshry (2007) that leaders should adopt thinking in systems to unravel the potential limitation of seeing in systems. The author's exploration of systemic thinking revealed that ignorance of the part that makes the whole is a recipe for most leaders' and managers' ordeal in business.

Leaders must think in systems that the unique challenges of managing and leading twenty-first-century organizations require leaders to develop unique characteristics for solving complex organizational problems. Nakamori (2020) advised that today's leaders must create new sets of creative techniques and excellent system-thinking skills to survive the tide of competition in a globalized world.

The nature of organizational leaders' problems has changed significantly over the last three decades, but the mode of operations remains unchanged (Gilissen et al., 2019;

Meadows, 2008; Nakamori, 2020). The drastic change informed Linkov and Trump's (2019) warning that today's managers and leaders must consider an immediate change approach. As the world becomes increasingly dynamic and complex and the failure of the traditional leadership approach becomes imminent, scholars advocate for introducing a new order in leadership.

Gilissen et al. (2019) and Oshry (2007) argued that the consideration of a reductionist paradigm is necessary for a holistic leadership view of the business operations. A reductionist model means understanding the 'whole' proceeds from appreciating the ultimate indivisible parts or elements (Baron & Daniel-Allegro, 2019; Gilissen et al., 2019; Meadows, 2008; Oshry, 2007). Today's organizations should appreciate the details of systemic thinking while being conscious of some apparent limitations.

Thinking in Systems' Potential Limitations

However, scholars and practitioners are concerned would not ignore some of the constraints surrounding the concept of systems thinking. Dieckmann et al. (2020) observed that there is always a human side of every sound system. The authors are disturbed by the considerations that selfish managers and leaders prefer to choose what they want to see, depending on their interests. In a qualitative phenomenological study, "Human capabilities for systems leadership: Disseminating systems thinking through education and training," Dieckmann et al. (2020) argued that the overall system contribution would diminish when managers and leaders deliberately decide to see only the parts of the system they want to see. Oshry (2007), in his book, "Seeing Systems –

Unlocking the Mysteries of Organizational Life," described the selfish inclination of leadership preference to seeing only interesting parts as "system blindness" (p. xvi). System blindness is a drawback to the concept of thinking in systems.

In the US Challenger case study, the engineers identified a technical problem with the synthetic rubber O-rings sealing the rocket motor's joints. The engineers were concerned that the "cold temperatures at the time will cause a failure in O-rings and the space shuttle" (Bolman & Deal, 2013, p. 186) and advised for the delay in launching the space shuttle. However, NASA and Thiokol's top executives, who were blind by their political and selfish interests, ignored the advice (Bolman & Deal, 2013). The act resulted in the catastrophic end of the astronauts involved. The space shuttle tragedy remains an abysmal case of systemic failure in the history of the United States.

The limitations of thinking in systems also affected the different agencies responsible for rescue operations in natural disasters of various kinds. Gareth Morgan (2006), in his book "Images of Organization," describes this act as "Psychic Prison" (p. 208). In his words, managers, and leaders often "become trapped by favored ways of thinking" (p. 208). The department managers for homeland security would coordinate the different agencies differently if they used a systematic approach rather than the traditional approach. For instance, Bolman and Deal (2013) cited a lack of coordination between the department of homeland security and the police and fire services as the reason for the high death toll rate in the September 11, 2001, terrorist attack in the United States.

Only managers and leaders with critical thinking skills understand the complexities of organizational systems that result in desired outcomes in today’s hyper-

competitive business environment (Alameddine et al., 2020). Understanding the fundamental concept of thinking in systems will help managers and leaders "manage messes" in the organization (Aron, 2020). Gilissen et al. (2019) observed that the dynamic situations involving complex systems of changing problems that interact with each other continuously confront managers and leaders. The authors argued that the challenges would have been less cumbersome if the issues are independent of each other.

Leaders who are inclined to understand the dynamics of systems thinking can develop a framework for improved human-system interaction (Hallo et al., 2020; Uhl-Bien & Marion, 2008). It is suitable for organizations to have the right mix of resources. Still, more importantly, it is the need for harmony and coordination of the resources to produce the desired result. Hoogeboom and Wilderom (2020) argued that only leaders with systems thinking, and networking skills can achieve such coordination. All the nodes are seen and presumed to be equally superior for the perfect functioning of the network.

Complexity Thinking and Broadband Internet

As discussed in the earlier sections of this chapter and the accompanying failure to achieve the right level of penetration in Lagos, Nigeria, the overriding benefits of broadband Internet justify the need to consider a nonlinear approach to understanding the real challenge of broadband Internet penetration in Lagos, Nigeria. Previous studies revealed that specific leadership problems require complexity thinking rather than the traditionally organized and coordinated thought pattern (Crowell & Boynton, 2020; Galkina & Atkova, 2019; Hallo et al., 2020; Tourish, 2019). Tourish (2019) argued that it

might be challenging to break away from the conventional functionalist theories that dominated scholarly exploitation in the twentieth century.

It may not be out of thought to continue to admit and acknowledge the limitations of these theories. The author observed that complexity thinking is the introduction of traditional leadership thinking into a complex organizational context. The rhetoric of turbulence and unprecedented change in today's business environment has forced leaders to adapt, learn, and create new approaches to solving complex organizational challenges (Hoogeboom & Wilderom, 2020). The creation of new approaches to solving organizational problems in Nigeria is one of the fruits of this study.

The theoretical challenge that has bewildered the Nigerian telecommunication industry policymakers on achieving an acceptable broadband measure might require a temporary deviation from the foundational assumption of the problem (Adepetun, 2019). Complex thinking entails that those who occupy leadership positions and debate how to achieve broadband penetration in Nigeria are complex beings with open horizons to pursue other non-traditional broadband factors. Figure 2.5 explains the present situation and the roadmap the researcher seeks to examine.

Figure 7

Complexity and Traditional Thinking Broadband Penetration Factors

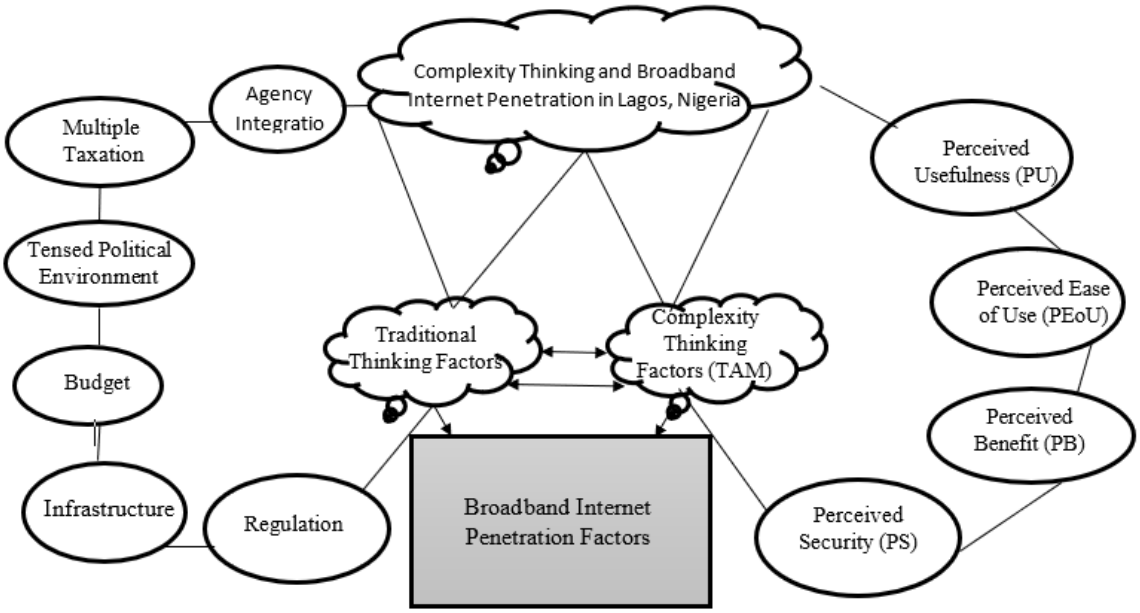


Figure 7 is a representation of the complexity and traditional broadband penetration factors framework. The figure depicts the two major factors that impact the rate of broadband penetration in Nigeria. As noted by the industry actors and scholars (Nwankwo, 2018; Teniola, 2017), one of the two center cloud boxes represents the TFs while the second center cloud box represents the complexity thinking elements using the constructs of Davis' (1989) and Obinkyereh's (2017) (TAM. Scholars and industry players have attributed the low broadband Internet penetration rate in Nigeria to the deficit of the TFs (Abang, 2016; Ogunfuwa, 2017; Teniola, 2017). However, there had been instances where the conventional factors were supplied but had a minimal positive impact on the rate of broadband (Ogunfuwa, 2017).

Consequently, the rate of broadband for the entire country is theoretically at 33.3% at the time of this study (Communication Week, 2019; Onwuaso, 2019). The craving for a solution continues. I intend to examine the relationship between the complexity thinking factors of PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos.

Policymakers and leaders are under immense pressure to improve the broadband penetration rate in Nigeria, and it does appear that they could not achieve the goal in a hurry (Elebeke, 2019). The restlessness stems from the assumption that improving the rate of broadband could translate to a high standard of living, economic growth, and poverty reduction (Elebeke, 2019; Jayakar, 2018; Kelly & Rossotto, 2012; Urama & Ogbu, 2018). The new thinking gave rise to complexity, which entails reviewing the low penetration rate using a complexity thinking lens.

The reason is that Urama and Ogbu (2018) and Adepetun (2019) observed that there is a gross failure of the conventional approach to solving the broadband Internet deficit in Nigeria. The authors also agreed with Teniola (2017) and Nwankwo (2018) that the TFs have indisputably affected broadband development in Nigeria, but that it is time to look beyond the turbulence, uncertainty, and policy bankruptcy. Nakamori (2020) argued that looking beyond what is known requires that today's leaders consider the complexity and systems thinking approaches.

Nakamori (2020) noted that leaders could adapt and learn from the failure of the past by using a systemic mindset to consider other societal factors (people side) that may be affecting broadband infrastructure development. That is the focal point of this study.

Scholars have explored how thinking in systems has changed different fields of study. Alameddine et al. (2020) studied "Systems thinking advancing health advocacy training; a perspective from junior family physicians in the Middle East." The authors argued that medical schools in the Middle East should promote the concept of advocacy in teaching rather than on an individualistic approach to public health. The proposal is for doctors to consider systems thinking that provides the rational process for relationship mapping.

Alameddine et al. (2020) observed that systemic thinking would allow physicians to engage other stakeholders in the healthcare system to understand the dynamics and complexities of the public health care system's relationships. The authors concluded that scholars and practitioners undermined the power of collaborative advocacy in the public health system. Aron (2020) aligned with Alameddine et al. (2020) that leaders' failure to apply systems thinking to solve complex world problems might jeopardize essential aspects of organizational life.

I chose to apply the TAM by Davis (1989) and the GST by Von Bertalanffy (1972) in this study. The American Biologist’s interest was about an open system that produces a complex interaction. The theory provides that a system is a set of interrelated elements standing about the environment (McMahon & Patton, 2018; Von Bertalanffy, 1972). The decision is opposed to the positivist paradigm that limits the extent and level of scrutiny to what can be measured rather than what is more critical (Babbie, 2017).

Against this backdrop, I draw inspiration from TAM, systems, and complexity scholars to prioritize what Baron and Daniel-Allegro (2019) described as a sway away from mundane approaches. A situation where leaders seek legitimacy by following the

rules irrespective of disruptive changes that justify the non-negligence of any part of the system is now dysfunctional. The perspective exposes what Tourish (2019) considers an illusion that leaders thought they are infallible, fully formed with unproblematic goals until they face complex situations. Leaders need to establish a comfortable balance between power, control, politics, resistance, and organizational sustainability (Bolman & Deal, 2013; Crowder et al., 2020; Dieckmann et al., 2020). Systemic thinking helps leaders to secure a balanced view in a complex adaptive atmosphere.

The need to establish the extent to which the complexity thinking factors of PU, PB, PEoU, PS affect community members' and leaders' BI to allow BIID at the local community level in Lagos. Therefore, it is necessary to establish the interrelationship of the bigger oval outlined shapes as elements of the complexity thinking factors in figure 2.5 and broadband penetration rate. The four oval complexity factors oval shapes are the scholarly focal interest that Adepetun (2019) considered the most ignored factor in the broadband Internet deployment ecosystem.

System thinking draws attention to a minor node in a network diagram as equally essential to establish the essence of network connectivity (McMahon & Patton, 2018; Van Woensel, 2020). Indeed, the American Biologist might be correct that the parts are as important as the whole (Von Bertalanffy, 1972). The TAM by Davis (1989) and Obinkyereh (2017) provided the constructs within the complex system to measure the BI of the community members and leaders. At the end of this study, I would establish the significance of the relationships between the complexity thinking factors in figure 7 and

Lagos' broadband Internet penetration rate. Therefore, it is necessary to summarize each of the complex thinking factors that I operationalized in this study.

Perceived Usefulness

The telecommunication industry in Nigeria has evolved tremendously since 2001 after the successful auctioning of the 2G Digital Mobile License and industry liberalization (Nwankwo, 2018; Ogunfuwa, 2017). The Federation government application of the liberalization policy to the telecommunication sector ushered in the beginning of the auctioning of GSM (Global System for Mobile Communications) licenses and the registration of four (4) GSM licensees in Nigeria (Presidential Committee on Broadband (2013). Since then, the industry has experienced impressive growth, and the GSM companies have introduced different service-improvement measures, including performance and capability upgrades.

Tugbiyele (2019) observed that the improvement map includes upgrading from the 2G network to 3G and 4G. Now, there is a consideration to further upgrade to the 5G network. Bridges (2019) argued that there is a knowledge gap on the benefits and functionalities of the network capabilities at the respective stages during an upgrade process in the local community. The strides and the gains that the industry has experienced over the years could be theoretical without impact if community members and leaders are not convinced that BIID could improve their job performance, economic growth, and general welfare. New deployment and improvement upgrade gradually become developmental barriers as community members and leaders exhibit BI to allow BIID at the local community level (Adepetun, 2019; Dawadi et al., 2020; Onwuaso,

2019). The attitudinal display towards the acceptance of broadband has become a subject of investigation, especially as Rafique et al. (2020) argued that people show an adverse interest in technology adoption when considering the effort required to use the technology.

Perceived Ease of Use

Studies have attributed violence, anger, and other unhospitable behaviors among persons in developing nations to frustration and laziness (Bullu, 2020; Obi, 2020; Qasim, 2020; Sandema-Sombe, 2019). The sterling statistics about the high rate of frustration in Nigeria is a testimony that raises some concerns, not to the immediate community alone. NASSCO (2020) and Quartz Africa (2018) opined that the frustration from poor governance, leadership corruption has mentally impoverished the people to accept laziness as a norm and unwillingness to learn and adopt technology deployment. Community members at the rural-urban settlement part of Lagos could perceive the deployment of broadband Internet as a technology that requires so much effort to use. Olatona et al. (2019) observed that the perception for ease of use is often without the consideration for a trial to extol the economic benefit of broadband to the community, the state, and the country at large above every other factor.

Perceived Benefit

The local communities in most developing nations suffer from years of neglect that leave the infrastructure in a dilapidated state (Osho & Adishi, 2019). Cobbinah et al. (2020) conducted a quantitative correlational study to examine the effect of population growth and water supply. The scholar opined that one of the challenges confronting

major African cities is the problem of poor infrastructure. The authors observed that rural-urban migration consistently intensifies pressure on the existing near-average infrastructures in the cities.

Cobbinah et al. (2020) found that 87 million people in developing countries suffer from an infrastructural deficit, especially water supply. In related research, Abdulsalam and Babatunde (2019) researched inadequate electricity supply in Lagos. The authors conducted a time series analysis using an electrical energy demand forecasting model with an artificial neural network. Abdulsalam and Babatunde (2019) found that the electricity supply inconsistency accounts for the slow growth of small and medium enterprises in Lagos, Nigeria.

The researchers finding is also consistent with the World Bank. (2020b) report that infrastructural deficit is a major hurdle for businesses in Africa. The psychological downturn could mean a lot for community members and leaders to accept BIID. Cobbinah et al. (2020) revealed that the rural-urban population in developing countries finds it difficult to believe in the benefit of new technology because of the deception by past leaders. Therefore, it has become paramount to investigate the relationship between perceived benefit (PB) at the local community level and community members' and leaders' BI to allow BIID.

Perceived Security

The general notion at the local community level of less developed countries is that technology, especially broadband Internet access and cloud computing, could lead to unnecessary exposure to privacy and security threat (Ishola, 2017; Schmidthuber et al.,

2020). Internet security remains a huge source of concern to the acceptance and use of internet technology across the globe (Amodu et al., 2019; Gyaisey et al., 2019; Ndem et al., 2019). While people are concerned with individuals' behavioral activities as the reason for security exposure in some climbs, others are worried about the group's activities. Gyaisey et al. revealed that some corporate organizations had invested in systems to evaluate employees' surfing behavior on social media sites. The concern continues to generate problems on the need to have mitigation plans towards cyber-attacks while working on the coping strategies. Scholars reviewed the perception of internet users regarding security and safety.

Ndem et al. (2019) conducted a cross-sectional quantitative survey using community pharmacists and the customers as the survey population to investigate community perception of online pharmacy services in the Uyo metropolis of Nigeria. The authors used a self-administered survey questionnaire to 60 pharmacists and 500 consumers across the metropolis. Ndem et al. (2019) found that apart from the knowledge of the availability of online pharmaceutical services, the regulatory authorities need to standardize the operations, build consumers' confidence to alleviate the concern for using online services.

In a related study, Amodu et al. (2019) embarked on a quantitative inquiry to unravel the use of data on security implications of adopting the Internet of Things (IoT) by public relations professionals. The scholars collected data from 100 professionals in the field of public relations in Nigeria to determine their perception of the security of adopting the Internet of Things (IoT) technology. While the practice of public relations

online still elicits fear of safety. The authors found that there is existing widespread anxiety over the operation of sensitive information in cyberspace. There is a possibility of unauthorized access to overall privacy since IoT requires the interconnectivity of several data points to inter-operate. Access to one point means access to all the other data points.

The study by Gyaisey et al. (2019) forms the nucleus of the few reviewed articles, especially as it closely relates to this research. The scholars considered a qualitative exploratory study to investigate individuals' internet security perceptions and behaviors: Polycontextual contrast between Ghana and Nigeria. Gyaisey administered open-ended interview questions to 30 participants consisting of fifteen 15 Ghanaian respondents and fifteen 15 Nigerian respondents. The focal themes were perceived as a security threat, self-efficacy, susceptibility, and action. The authors found that almost 100% of the Ghanaians and Nigerians respondents do not trust using the Internet to deliver personalized content. The narratives from family members and friends in previous cyber-attacks instigated the fear of cyber-attacks from both respondents. There is a high perception of internet security threats by the Ghanaians and Nigerians communities. It is paramount to review past broadband technology adoption studies for a deeper understanding of the different perspectives. The purpose of this quantitative correlational study is to examine the relationship between PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos.

Prior Broadband Technology Adoption Research

There have been similar studies relating to the dependent variable of broadband Internet penetration, adoption, and deployment in both the developed and developing

nations of the world. All the studies identified with Dawadi et al.'s (2020) postulations that broadband Internet is a significant driver of today's global business space. However, none of the scholars consider relating complexity thinking to broadband Internet penetration in Lagos, Nigeria.

Tugbiyele (2019) embarked on a quantitative study to examine how the increasing 4G Network infrastructure in Nigeria could become a catalyst to improve eCommerce activities. The authors used correlation regression analysis. The results showed that a cross-section of Nigerians use low Internet broadband speed, limiting e-commerce activities and reducing the national GDP value.

Further analysis of the secondary data revealed that the low broadband Internet speed resulted from insufficient coverage of the 4G network in Nigeria. Tugbiyele (2019) argued that increasing 4G network penetration in Nigeria would positively impact Internet broadband speed. Also, high Internet broadband speed will improve e-commerce activities, and the GDP will grow by 20%. The scholars suggested that researchers consider the effect of the epileptic power supply on e-commerce and other national developmental plans. The study aligns with Agbata (2019) and Teniola (2017) on the call for policymakers to build a national infrastructure to boost Internet broadband speed and stimulate demand, global exposure, E-commerce activities, and foreign direct investment.

Nassif (2019) conducted a quantitative study based on the TAM and CCS adoption in Afghanistan. The purpose was to examine the significant relationship between perceived connectedness, perceived complexity, perceived privacy, PS, PU, perceived ease of use, and the approval and adoption of the CCS in Afghanistan. The

author defined connectedness as a fast, reliable broadband Internet service. Nassif (2019) found that bridging the digital divide through connectivity by deploying broadband Internet services will increase the adoption rate of CCS in Afghanistan by 29%. The study indicates that rural broadband Internet deployment could be competitive if the government deliberately subsidizes broadband investment at the rural level.

The author's opinions align with Akwaja's (2019) argument that nations should not use short-term return on investment to determine the feasibility of rural broadband investments. Nassif's (2019 study captured strategies for ICT implementation for small business owners. The findings could serve as a benchmark for new business owners seeking the best way to improve ICT influence on their businesses. The result of the study will attract IT leadership, managers, and solution architects to understand the challenges militating against CCS and adopt a mitigation plan. Such awareness will enable organizations or nations to consider working strategies for cloud deployment before utilizing the technology. The author recommended that future researchers consider a different kind of population aside from IT architects and ICT employees of an SME firm to investigate the BI to adopt CCS and the construct of TAM. The study presents a rare opportunity for scholars to consider different geographical environments using a different kind of sample.

Bridges (2019) was another researcher who investigated the impact of broadband policy on rural providers using an interpretive phenomenological analysis. The author inquired to know how the FCC broadband regulatory effort affected the level of competition for rural broadband Internet services. Bridges (2019) found that investment

in rural broadband deployment diminishes because of the increased cost of implementation. The author found that infrastructure deployment cost exceeds the return on investment into rural broadband. The scholar, therefore, recommended that FCC should consider deliberate regulation that promotes rural broadband Internet deployment.

Bridges (2019) also found that rural broadband deployment requires substantial funding since its revenue is limited with a high return on investment (ROI). The researcher suggested that FCC expand its regulatory framework to accommodate subsidies for telecommunication operators to embark on massive rural broadband deployment. The scholar concluded that rural broadband Internet deployment could be competitive if the government subsidizes broadband investment at the rural community level. Short-term return on investment should not be used as a basis to determine the feasibility of rural broadband investment.

I did a careful exploration of more research in the field to understand and identify possible areas of positive impact. Mclver (2019) inquired into strategies for using information and communication technologies to improve profitability. The scholar embarked on a qualitative multiple case study to know the ICT strategy that small business owners use to enhance business profitability. Mclver (2019) made a detailed analysis that revealed that small business owners are slow to adopt technology for their business, affecting profitability. Mclver (2019) found that small business owners rely on technology for efficiency. The author argued that reliance on ICT would help small business owners manage expenses, processes and performance, and increased profitability.

Further analysis agrees with previous findings that adopting technology exposes business owners to global marketplace participation (Camba & Camba Jr, 2020; Chanclou et al., 2020; Gu et al., 2019). Mclver (2019) concluded that adopting technology and ICT will equip small business owners to contribute to the local and global economies. More so, new business owners who seek to experience growth and survive the tide of competition in today's business cloud should improve ICT influence on their businesses.

Hasan (2019) was another author who pitched with several other scholars in broadband Internet studies. The researcher conducted a mixed-method study to understand how wireless Internet service providers (WISPs) could work towards Scalable community networks. Hasan's (2019) analysis shows that dedicated spectrum and network automation at the edge of business processes and network operations are crucial elements for consideration to enable the scale of community cellular networks. Hasan's (2019) observation and Bridges' (2019) seem unanimous because government and policymakers are the significant drivers of broadband Internet at the local community level.

Hasan (2019) identified rural connectivity challenges to be a mix of both technical and non-technical. Rural network operators face financial constraints in the delivery of network services to the end-user. Against the backdrop, the scholars secured the conviction that government intervention is pivotal to delivering reliable broadband Internet connectivity at the rural community level (Bridges, 2019; Hasan, 2019; Nwankwo, 2018; Teniola, 2017). Cellular network operators in the rural community face

dual challenges of physical network failures and poor spectrum allocation. The combined effect of the structural defect and the perceived poor financial returns are the reason for the renewed agitation for the necessity of government intervention to achieve a robust rural broadband Internet.

The exploration of the various research confirms that most of the studies have broadband Internet as a dependent variable and predicted by several other factors depending on the individual scholar's research interest. Still, none of the researchers consider relating complexity thinking to broadband Internet penetration in Lagos, Nigeria.

Therefore, I seek to use this quantitative correlational study to examine the relationship between the complexity thinking factors of PU, PB, PEoU, PS, and community members' and leaders' BI to allow BIID at the local community level in Lagos. I operationalized complexity thinking factors as PU, PB, PEoU, and PS (independent variables). I intend to examine how the independent variables relate to community members' and leaders' BI to allow BIID at the local community level in Lagos (Adepetun, 2019; Akwaja, 2019; Olaide et al., 2017; Onwuaso, 2019). The proposed study could have a significant positive social change as identified by Kelly and Rossotto (2012) and Nwankwo (2018) that research on improving the broadband rate for developing nations can positively transform societies' social lives.

ITU (2017) and The NCC (2018) also observed broadband's positive social change effect on the sectors of education, economy, agriculture, transportation, health, manufacturing, employment, and society's overall well-being. The positive social change

effect is possible because deepening the broadband rate could improve government processes and global service delivery to the people they govern.

Summary and Conclusions

The theme of chapter two of this study was to review relevant, necessary, and contributory literature resources regarding complexity thinking and broadband Internet penetration in Lagos. I focused the literature search strategy on the explanation of the general and the specific problem statements. I also dissipate energy in exploring prior research literature resources that align with the purpose of the study. I intend to examine the relationship between the complexity thinking factors of PU, PB, PEoU, PS, and community members' and leaders' BI to allow BIID at the local community level in Lagos.

This research effort might fill the gap in the many literature resources in broadband Internet, leadership, and telecommunications. I identified that different scholars did not give the specific gap of complexity thinking and broadband Internet penetration attention in the past. They instead focused on the effect of TFs on broadband Internet development. I intend to fill the identified gap through empirical investigation by sending survey questionnaires to three purposively selected communities in Lagos, Nigeria. A stratified sample technique would target only the community members and leaders who have access to the Internet and are on the respective community social media platforms. I shall use the G*Power statistical software version 3.1 by Faul et al. (2007) to determine the actual sample size from the population.

Chapter 3: Research Method

The purpose of this quantitative correlational study was to examine the relationship between PU, PB, PEoU, PS, and community members' and leaders' BI to allow BIID at the local community level in Lagos. The target population for this study included community members and leaders from three purposively selected local communities in Lagos State, Nigeria. The communities were Igbe-Ikorodu, Gowon Estate, and Idumagbo Avenue-Lagos Island (Adeniyi et al., 2019; Lagos State Government, 2012). The independent variables were PU, PB, PEoU, PS and the dependent variable is community members' and leaders' BI to allow BIID. The study could help the policymakers identify the possible mitigation factors that may improve broadband Internet penetration. The positive social change effect aligns with Ogunfuwa's (2017) and Elebeke's (2019) postulations that enhanced broadband Internet penetration translates to improved economic growth, lower poverty rates, and social vices reduction.

This study focused on understanding how the complexity thinking factors (independent variables) relate to broadband Internet penetration (dependent variable). I operationalized the dependent variable as community members' and leaders' BI to allow BIID. This chapter also provides detailed information on the research method and design, sample size, population, and the procedure for recruiting participants and data collection. I discuss the techniques for analyzing the data, the threat to validity and reliability, ethical issues in research, instrumentation, and the institutional review board guidelines on participants' consent

Research Design and Rationale

I used three purposively selected communities in Lagos State as the population and communities of best fit. I also designed the study as a quantitative correlational study. I decided to use these communities because of the need for a dependable sample that synchronized with my generalization criteria for communities with similar characteristics in Nigeria. The independent variable, complexity thinking, has been further reduced to some variables of interest that I identified as complexity thinking factors for contextual reinforcement. The factors were PU, PB, PEoU, PS.

I operationalized the dependent variable, broadband Internet penetration, as community members' and leaders' BI to allow BIID at the local community level. The quantitative correlational study enabled me to assess the relationship between the independent and the dependent variables. Using the quantitative correlational design further helped me use Pearson's correlation and multiple regression analysis to test the strength of the relationship between the complexity thinking factors (PU, PB, PEoU, PS), and community members' and leaders' BI to allow BIID at the local community level in Lagos.

Frankfort-Nachmias and Leon-Guerrero (2018) argued that it is not enough to identify relationships between variables without understanding the strength, the extent, and the degree of association. Pearson's correlation measures the association between variables to determine the existence of strength between variables. In this study I examined the extent of the relationship between the complexity thinking factors (PU, PEoU, PB, PS) and broadband Internet penetration operationalized as community

members’ and leaders’ BI to allow BIID at the local community level in Lagos. I employed the quantitative methodology correlational design to answer how the complexity thinking factors relate to community members’ and leaders’ BI to allow BIID at the local community level in Lagos.

The epistemological and ontological underpinning favors adopting a quantitative methodology (Ahmed, 2008; Burkholder et al., 2016). I combined the theoretical strands of system thinking into complexity thinking to test the extent of the relationship between complexity thinking factors and community members' and leaders' BI to allow BIID at the local community level. This process could lead an epistemological purist to subscribe to a humanistic science model of postpositivism (Babbie, 2017; Gray, 2019). Correlation measures the extent of the relationship between the independent variable (complexity thinking factors) and the dependent variable (community members' and leaders' BI to allow BIID at the local community level).

I considered qualitative or mixed methods research, but they would have distorted or created a deviation in my role in creating meaning. The qualitative researcher primarily relies on qualitative data and inductive theorizing (Ary et al., 2018), which is far from my philosophical stance for this study. I chose the quantitative research method because the quantitative researcher depends on manipulated numerical data aligned with the constructs and transformed into efficient data display through deductive theorizing (Flick, 2018; Frankfort-Nachmias & Leon-Guerrero, 2018). Although qualitative data can be digitized, synthesized, and even counted, Bansal et al. (2018) observed that doing so first requires interpretation of the data to discern patterns and insights. Such

understanding and discernment were not a suitable approach for the epistemological structure of this study. Flick (2018) further argued that the broad form in which qualitative data appear might shape the researcher's ontological and epistemological assumptions to fit into the analytical process.

A critical evaluation of the qualitative method discredited it for use in this study because of the deficiency to generalize the result. As the cornerstone of qualitative research, inductive theorizing did not align with my philosophical assumption for this study. I did not consider mixed methods because it combines quantitative and qualitative strands that I did not need for this study. The quantitative approach adopted was enough because it helps a researcher deduce new knowledge that relies heavily on logical reasoning based on prior insights and expands understanding (Ravitch & Carl, 2016).

Methodology

Population

This study's focused population consisted of three purposively selected local communities in Lagos State. The communities were Igbe-Ikorodu, Gowon Estate, and Idumagbo Avenue-Lagos Island (Adeniyi et al., 2019; Lagos State Government, 2012; Ndichu et al., 2019). These communities share certain character traits regarding accepting new technology, specifically BIID (Badmos et al., 2019). The participants must be 18 years and above with access to either mobile or fixed wireless Internet. The total human population of Internet users in the three local communities is 1,688 (Bamiteko & Adebiyi, 2020; Chika & Prince, 2020; Lagos State Government, 2012; NCC, 2020). The World Population Review (2019) put the current Nigerian population at 200 million with

774 local community areas. I referenced industry data collected and published on the web portal of the regulator, the NCC (2020). The data revealed that approximately 132,013,241 Nigerians have access to the Internet.

Table 2

Latest Population Census of the Three Local Communities

		Latest population census		
SN	Local lommunities	Male	Female	Total
1	Gowon Estate-Alimosho	773	667	1440
2	Igbe-Ikorodu	68	61	129
3	Idumagbo Avenue-Lagos Island	71	48	119
	Total	912	776	1688

Note. From *Abstract of Lagos State statistics. Lagos Bureau of Statistics Ministry of Economic Planning and Budget, Secretariat, Alausa, Ikeja.* by Lagos State Government (2012, p. 2).

Sampling and Sampling Procedures

The NCC gathers industry subscribers' data by sending questionnaires to all the operators in the Nigerian telecoms industry. The regulator gets Internet access user information by technology type as mobile GSM, mobile CDMA, fixed wired, and VoIP (NCC, 2020). NCC used purseful sampling techniques by sending the questionnaire to the biggest and active operators in each of the strategic group mappings using different technology types. Purposeful sampling is a sampling technique that the researcher uses to strategically select information-reach cases to study cases that, by their nature and substance, will illuminate the inquiry question under investigation (Daftary & Craig, 2018; Ravitch & Carl, 2016). The sampling procedure deals with the selection of

information-rich cases for in-depth study. Ravitch and Carl (2016) further expatiated that the purposeful sampling technique is a tool for researchers interested in providing context-rich and detailed accounts of specific populations and locations.

The sample I proposed for this study includes relevant participants to be surveyed using a stratified sampling technique by targetting selected Internet users already on the social media platforms (WhatsApp and Telegram) in the three purposively chosen communities. I will use survey monkey to share the links to the questionnaire on these selected social media platforms. The communities are Igbe-Ikorodu, Gowon Estate, and Idumagbo Avenue-Lagos Island. The focal sample consists of respondents with access to the Internet through mobile devices, fixed wired or wireless, and regularly uses them for connectivity purposes. The respondents could click on the link on the respective communities' social media platforms. I had discussed and planned to share the link with the representatives from the three communities to access the targeted community members and leaders for the study.

Sampling Size Determination

The general notion is that the larger the sampling size in quantitative research, the lesser the sampling errors (Creswell & Clark, 2017; Slavin et al., 2019). Sassenberg and Ditrich (2019) and McNeish and Stapleton (2016) agreed that a correlational study with a clustered sample of between 50 and 100 is likely to produce an unbiased estimate. However, Onwuegbuzie (2020) argued that linking sample sizes to the research paradigm has become very popular with scholars across boards. Still, the development poses so much concern for the research world because of its misleading effect. The author

summarized that there are times when it is suitable to consider small sample sizes for quantitative studies. Also, some circumstances may necessitate the use of large sample sizes for qualitative studies.

The sample size for this study is substantial, as determined with G*Power software 3.1.9.7. The G*Power software is an open-source statistical tool for sample size determination (Faul et al., 2007). I determined the sample size to minimize false-negative data reporting and sampling errors using the power analysis. More so, Obinkyereh (2017) and Nassif (2019) are examples of other studies using the TAM theoretical model that applied the G*Power tool to determine the suitable sample sizes for their studies. Obinkyereh (2017) used 0.90 power or the F-test statistics, an alpha level of 0.05, the effect size was 0.15, and the predictors of five variables to arrive at a sample size of 116 participants as the required sample size. I shall employ a linear multiple regression fixed model, single regression coefficient as the best-fit criteria to calculate the sample size that best predicts my dependent variable. The input includes a power of 0.95 for the F-test statistics, an alpha level of 0.05, the effect size shall be 0.15, and the predictor variables shall be four for the priori sample size computation. Table 3 shows the G*Power input and output sample size calculation.

Table 3

*G*Power Sample Size Calculator Input and Output*

F tests - Linear multiple regression: Fixed model, R^2 increase
Analysis: A priori: Compute required sample size
Input:

Effect size $f^2 = 0.15$

α err prob = 0.05

Power (1-β err prob) = 0.95

Number of tested predictors = 4

Total number of predictors = 4

Output:

Noncentrality parameter $\lambda = 19.3500000$

Critical F = 2.4447662

Numerator df = 4

Denominator df = 124

Total sample size = 129

Actual power = 0.9505747

Determination of Sampling Size Distribution

The general impression is for researchers to proceed to the field and collect data based on the determined sample size. Agbionu et al. (2018) advised the need to choose the various proportion of the sample for a distributed population once the sample size is known. I shall be using Bowley's 1926 proportionate allocation formula (Aldrich, 2008) to determine the sample sizes for Gowon Estate, Igbe-Ikorodu, and Idumagbo Avenue. Agbionu et al. (2018) used the same model to allocate proportionate sample sizes among three institutions, and the result was positive (p. 78). The G*Power output in table 4 and figure 8 shows the required sample size calculation for this study. The table indicates that the total sample size for the three purposively selected communities one hundred and

twenty-nine (129) respondents. I will adopt Bowley's proportionate allocation formula used by Agbionu et al. (2018) and Ozomadu et al. (2019). The model:

$$Nh = \frac{n \times nh}{N}$$

Where N = Total population size

Nh = Units to be distributed to members of a subset

nh = Total number population of respondents in each subset

n = Determined sample size

$$Nh = \frac{\text{Determined sample size by Total population in each group}}{\text{Total Population size}}$$

$$\text{Gowon Estate, Alimosho} = \frac{129 \times 1440}{1688} = 110$$

$$\text{Igbe-Ikorodu} = \frac{129 \times 129}{1688} = 10$$

$$\text{Idumagbo-Lagos Island} = \frac{129 \times 119}{} = 9$$

Table 4

Sample Size Distribution

S/N	Communities	Communities' in-group population	Selected sample size
1	Gowon Estate - Alimosho	1440	110
2	Igbe-Ikorodu	129	10
3	Idumagbo-Lagos Island	119	9
	Total	1688	129

Procedures for Recruitment, Participation, and Data Collection (Primary Data)

The data for this research covers primary data. I collected primary data from three selected local communities in Lagos using Survey Monkey, an online third-party data collection procedure. Previous studies that adopted the TAM model used Survey Monday for data collection and described it as flexible and easy to use (Çoban, 2020; Hong et al., 2020; Pegues et al., 2019). I shared the link to the Survey Monkey's questionnaire on the social media platforms of the three selected local communities using liaison research assistants that have accepted to assist. Each of the assistants had acknowledged the recruitment email and reiterated the willingness to participate. See Appendix A for questionnaire demographic information and Appendix B for permission to use the data collection instrument.

I have drafted a letter to seek the participants' consent, subject to further review and approval. The letter's content is part of the informed consent form that I would seek

permission from the Institutional Review Board (IRB) before proceeding to the field for the data collection. I stated that I intend the survey to be for all users of Internet services within the three selected local communities in Lagos. Part of the letter's details is that respondents will only need roughly 15 minutes to complete the survey questionnaire. It is also important to mention that there are minimal risks associated with participating in filling the questionnaire. I would notify the proposed participants that only a fully completed questionnaire could be helpful. More so, the participants are at liberty of their individual choices to answer the questions or not. I would state brazenly that a participant can exit participation at will at any time.

Archival Data

The archival data for this study are only supportive, referencing, published secondary data of the respective government agencies with relevant input to this research. I will source the published data from the Federal website on population and poverty rate, The National Bureau of Statistics (NBS) website, and published data on the NCC website. I would use referenced data from these sources only for cross-referencing the result of the primary data analysis. The active Internet subscription by geographical location data presently exists on the regulator's web portal. The data reveals the 132,013,241 Nigerians who currently have access to the Internet (NCC, 2020). I will use the information as a reference to understand the distribution of people who have access to the Internet in the three selected local communities. I would subject the primary data analysis to analysis using the statistical package for social sciences (SPSS) software. It would help to determine the relationship between the complexity thinking factors (PU,

PEoU, PB, PS) and broadband Internet penetration operationalized as community members' and leaders' BI to allow BIID at the local community level in Lagos.

Instrumentation and Operationalization of Constructs

The instrument I proposed for the primary data collection for this correlational non-experimental research is a survey questionnaire. The goal is to eliminate the possibility of conducting a pilot to test reliability and validity using a pre-existing instrument by Obinkyereh (2017). The instrument is an approved credible doctoral research instrument tested and accepted as valid and reliable for data collection. Obinkyereh (2017) embarked on a quantitative correlation study on cloud computing adoption in Ghana using the TAM as the theoretical foundation. The study shares many similarities with the proposed research, including the philosophical and cultural mix of the participants.

Gyaisey et al. (2019) argued that Ghanaians and Nigerians are on the same scale on Hofstede's cultural dimension of collectivism. Gyaisey et al. found that Nigerians and Ghanaians have the same security perception index on the BI to adopt Internet technology. I shall be assuming the same variables of PU, PEoU, PB, and PS (Rashif & Zuberi, 2017). Obinkyereh (2017) had achieved Cronbach's alpha coefficient of reliability value of between 0.81 and 0.83 (p. 60). Perceived accessibility is the only predictor that does not apply to the proposed study. The readings reflect the reliability of the instrument's suitability in measuring the relationship between the constructs in the variables. It is also important to note that Obinkyereh (2017) used a sample of 20 respondents to pre-test the survey instrument in a pilot study. The scholar used an SPSS

scale test to analyze the output of the Cronbach alpha considering the reliability score benchmark of 0.7 for reliability and consistency. Obinkyereh's pre-test Cronbach alpha's score was "0.827" to confirm that the survey instrument was consistent and reliable (Obinkyereh, 2017, p. 53)

The case processing summary table indicates a favorable response rate of 135 respondents out of 150 questionnaires. Obinkyereh's (2017) calculated sample size figure was 119 participants, but the scholar achieved 16 more respondents ahead of the determined sample size. About the actual 150 questionnaires, the responses are short by 15, given a 90% response rate. The high response rate justifies using a similar instrument for the proposed study with a calculated sample size of 129 participants. Obinkyereh's research is available in the ProQuest database. The scholar has also given me written permission to use the survey instrument with similar constructs. Refer to Appendix B.

Operationalization of Variables

The variables for the proposed study align with four TAM variables of PU, PEoU, PB, and PS. I will measure each of the four independent constructs by one dependent variable (community members' and leaders' BI to allow broadband BIID at the local community level). I operationalized complexity thinking as the independent variable of this study (PU, PB, PEoU, PS). I operationalized Broadband Internet penetration as community members' and leaders' BI to allow broadband BIID at the local community level. Thus, the purpose of this quantitative correlational study is to examine the relationship between PU, PB, PEoU, PS, and community members' and leaders' BI to allow broadband BIID at the local community level in Lagos.

his study's questionnaire will consist of two sections (part I and part II). Both parts aligned with the structure of Obinkyereh's (2017) instrument. I presented the demographic information in "Part I," and the research survey questions on the predictor and dependent variables are in Part II. I stated the respondents should indicate whether they agree or disagree with each statement on broadband Internet penetration by selecting the appropriate number on the five-points Likert scale of 1 (strongly disagree), 2 (disagreed), 3 (Neutral), 4 (agreed), and 5 (strongly agree). I used the identical variable scores in the adopted instrument and clarified that the respondents should choose the closest number that matches the perception of broadband Internet penetration adoption. I presented a brief clarification of the construct analysis for data collection in Table 5.

Table 5

Constructs Analysis for Data Collection

S/N	Variables	Parameters	Variable Scores	Sources
1.	Complexity Thinking factors	Perceived usefulness (PU)	3	Obinkyereh (2017)
		Perceived ease of use (PEoU)	4	Obinkyereh (2017)
		Perceived Benefit (PB)	3	Obinkyereh (2017)
		Perceived Security (PS)	4	Obinkyereh (2017)
2.	Broadband Internet penetration factor	Behavioral intention (BI) to allow BIID	3	Obinkyereh (2017)

Data Analysis Plan

The primary concern of investigative studies is a statistical analysis that shows empirical evidence justifying the need for the research (Slavin et al., 2019). The goal of this study is to use the TAM model to analyze the existence of a relationship between the complexity thinking factors (PU, PEoU, PB, PS) and broadband Internet penetration operationalized as community members' and leaders' BI to allow BIID at the local community level in Lagos. At this juncture, I will recap the research questions and hypotheses to usher in the data analysis plan discussion. The analysis plan will show in

detail how I intend to answer the research questions. As mentioned in chapter one, I used four research questions and hypotheses in this study.

Research Questions and Hypotheses

RQ: How does PU, PEoU, PB, PS relate to community members' and leaders' BI to allow BIID at the local community level in Lagos?

H_0: There is no relationship between PU, PEoU, PB, PS, and community members' and leaders' BI to allow BIID at the local community level in Lagos.

H_A: There is a relationship between PU, PEoU, PB, PS, and community members' and leaders' BI to allow BIID at the local community level in Lagos.

The proposed research is a quantitative correlational study that requires quantitative research analytical tools to produce the desired result. I planned to use IBM's Statistical Package for the Social Science (SPSS - 27) software for the data analysis. I draw inspiration from some notable technology scholars who used the SPSS package in the past for statistical analysis, and the resulting output was excellent (Ishola, 2017; Nassif, 2019; Obinkyereh, 2017; Otika et al., 2019). I shall be using Pearson's correlation coefficient to determine how the variables of complexity thinking factors are associated with broadband Internet penetration from a holistic standpoint. Pearson's correlation is one of the most reliable analytical tools to show whether variables are positively or negatively correlated. The bivariate analysis was to test how each independent variable relates with the dependent variable. The multiple regression analysis would test the hypotheses after trying for the various assumptions. Frankfort-Nachmias and Leon-Guerrero (2018) opined that the multiple regression analysis is proper for more than one

independent variable. The study uses four independent variables (PU, PB, PEoU, and PS) as predictors and one dependent variable (community members' and leaders' BI to allow BIID at the local community level in Lagos). I will run a comprehensive analysis to check the possible effect of control in between the variables of the study (PU, PEoU, PB, and PS). I will also use variance (ANOVA) analysis to compare the means of community members' BI to allow BIID from community leaders.

Data Cleaning and Screening Strategy

Data cleaning is another focus area. Frankfort-Nachmias and Leon-Guerrero (2018) observed that incorrect and inconsistent data lead to errors, false assumptions, and faulty conclusions. Therefore, it is my absolute prerogative to screen and remove all erroneous responses from the survey participants. I will focus on the objective of data screening and cleaning to detect errors and remove, replace, or modify the data that is inconsistent with the study sample. All respondents for the proposed survey must answer questions directly related to the study's model and the scope of this research. The questions would cover both the independent and dependent variables. For instance, the complexity thinking factors of PU, PB, PEoU, and PS. The questions on broadband Internet penetration as the dependent variable that I had operationalized community members' and leaders' BI to allow BIID at the local community level in Lagos.

Threats to Validity

The quality of design and evaluation is key to the success of any phenomenon. Design constitutes the primary determinant of failure or success and a formidable factor of the research project (Brown et al., 2017; Plano Clark & Ivankova, 2016; Turner et al.,

2017). Turner et al. (2017) argued that the only way to think about quality in research is to consider individual indicators to demonstrate that the investigation findings accurately represent the subject, phenomenon, or process in the study. These considerations became the focal point at the design stage. Hence, the scholar risks compromising the standard of the quality of research results, and in sum, makes the overarching outcome inaccurate and misleading (Burkholder et al., 2016; Plano Clark & Ivankova, 2016). In a bid to avoid all design and quality issues in a research investigation, researchers must seek to address the duo of validity and reliability as the two most crucial quality perspectives in quantitative research and aspects of trustworthiness in qualitative research.

External Validity

The threat to external validity is a fundamental consideration when discussing research quality design. It has to do with the extent or the degree to which a study holds when used across different contexts (Burkholder et al., 2016). External validity is the crucial determinant of a study's policy relevance. It might be at stake because of potential general equilibrium effects, Hawthorne effects, or representativeness problems that compromise generalizing results beyond the studied population (Turner et al., 2017). Users of research resources would want to know and understand how study findings can be generalized in other places or across cultural dimensions. Burkholder et al. (2016) identified several threats to external validity. These are; treatment variations, the interaction of other observed causal relationships with sample unit, types of outcome measures used, settings for the treatment, and context-dependent mediation.

I mentioned some external validity issues which align with the threats. The first is the observed causal relation with the sample unit. I chose three out of the seven communities in Lagos perceived to be hostile to broadband infrastructure deployment. Community members and leaders exhibit BI to allow BIID in these communities. The sample unit size might affect the generalization of the result of this study across the country and other geographical settings. However, G*Power as a widely acclaimed statistical tool for sample size calculation would minimize the threat to external validity.

The second issue that poses a threat to the external validity of this study is the treatment variation. I operationalized the complexity thinking factors as PU, PB, PEoU, and PS. These various levels of perception might assume different dimensions across other geography and cultural environments. The concern could affect context-dependent mediation as another significant threat to external validity. The advantage of using the TAM constructs, however, is that scholars have established them to measure technology adoption (Ishola, 2017; Nassif, 2019; Obinkyereh, 2017; Otika et al., 2019). Lastly, I suspect that the published secondary data on the NCC website might not be entirely free of errors. The respondents across the different telecommunication companies could be distracted by the daily routine job assignments while completing the questionnaires.

Internal Validity

Internal validity is a very complex concept in any empirical investigation. It requires the researcher to understand the different trajectories leading to the results and conclusions. Burkholder et al. (2016) assert that internal validity can be surprisingly tricky because there are rival explanations for any given proposition about causal

inference. The competing statements are threats to validity. I intend to determine the quality of deductions in the proposed study by weighing the various threats to internal validity. Plano Clark and Ivankova (2016) observed that the following threats to internal validity should guide researchers in ensuring the quantitative study's quality. These are history, maturation, testing, instrumentation, statistical regression to the mean, researcher bias, selection, overall mortality, and differential mortality.

One of the threats to internal validity is associated with the question of the perception of security. The word security could be relative to different circumstances and persons. Some people use the word to express their confidence level about a phenomenon (Amodu et al., 2019). Others think of security from the perspective of a threat to life (Gyaisey et al., 2019). Yet, Ndem et al. (2019) consider security unnecessary exposure of a person's health information to the public. Thus, security could mean different things to individuals in other communities. A standardized pre-existing test instrument that previous researchers had used to measure this construct gives a reasonable level of confidence that the construct shall measure the researcher's intent. I nominated three contact persons as research assistants in the three selected communities. I wish and hope that their personal biases would not influence the participants' approach to the questions. The mitigation plan is that each Assistant would undergo an orientation program on the modalities to coordinate the links to the questionnaire on the respective community social media platforms.

I must also state at this juncture that the biases that the participants may express in answering the questionnaire are beyond my control. I intend to work closely with the

community selected research Assistants to calm the participants' stress by explaining the benefits that may accrue from the study to the community. Similarly, the respondents' mindset and environments when completing the questionnaires are not within my control. I intend to use published archive data from the NCC web portal strictly for reference to support my study. I may not be able to deal with all the issues around the history and maturation of the participants when responding to the questions. The mitigation plan is to track the trend of community members' and leaders' responses to similar infrastructure deployment BI research in the past and map it with the respondents' age.

Construct Validity

Construct validity relates to the researcher's intelligence and psychometric design with theoretical instruments (Burkholder et al., 2016; Plano Clark & Ivankova, 2016). I used pre-existing TAM constructs by Davis (1989) and Obinkyereh (2017), who validated them for reliability and consistency using the standardized instrument validation procedures. The variables I chose for the study represent the constructs I intend to investigate. For instance, I operationalized complexity thinking as PU, PB, PEoU, and PS (independent variables) and broadband Internet penetration as community members' and leaders' BI to allow BIID at the local community level in Lagos (dependent variable). The assurance of the research instrument to validate and measure these variables without contradiction is optimistic based on the use in previous studies. Bridges (2019) argued that the mitigation plan for construct validation uses a previously validated survey instrument. Tugbiyele (2019) also supported the assertion that a pre-existent tested survey instrument could validly measure the constructs under investigation. The wholesome

adoption of Obinkyereh's (2017) survey instrument has validated the constructs used in this study.

Ethical Procedures

Conducting a sound and well-tailored study entails so much more than the researcher might fathom at the design stage (Bansal et al., 2018). Perhaps, the scholar's understanding of what is suitable and acceptable regarding morality would further strengthen this outcome. Against this backdrop, researchers interested in social science study must equip themselves with all relevant guiding norms for proper research (Babbie, 2017). Therefore, ethical issues in research bother with voluntary participation, no harm to participants, anonymity and confidentiality, deception, institutional review boards, and professional codes of ethics (Babbie, 2017; Bansal et al., 2018).

These ethical issues can influence research design from a different perspective. The researcher had done a careful plan at the design stage before crafting the study's purpose, research problem identification, and the research questions. Therefore, I had insights about what is needed, who should be involved, and the professional requirements guiding the proposed study - IRB, URR, and NIH (Endicott, n.d). It is noteworthy that I structured the research topic and planned methodology to align with the provisions of the research ethics planning worksheet and the proposal ethical issues approval criteria by the institutional review board (IRB). The proposed study would align with the provisions of the Belmont Report of the Department of Health, Education, and Welfare (1979) that requires scholars to ensure due diligence in the selection of participants and obtaining

their consent when conducting research (National Institutes of Health (NIH) Office of Extramural Research, 2008).

I planned to consider the following ethical standards for this study to ensure that the research is amenable/dependable. I will minimize safety and privacy risks by using procedures consistent with a sound research design that would not expose the participants to unnecessary risks. I will ensure that the risks to participants are reasonable about anticipated benefits. I intend to equitably select the participants so that the burdens and the benefits of the study would be fair. I will obtain informed consent by writing to the participants and documenting them with the institutional review board. I will minimize and explain the perception of coercion in participation, especially among potentially vulnerable participants. I will send the survey link to the community research Assistants using a secured internet connection sitting behind a firewall while transferring the filled questionnaires to a designated database. I will store all electronic materials in a secured directory in an official “OneDrive” cloud infrastructures and password-protected external storage devices. My storage strategy for the physical storage devices shall be a physical lockbox.

Summary

I discussed the details about the methodology of this study in this chapter. It includes research design and statistical tools: the population, sampling procedures, instruments, and operationalization of constructs. I also discussed the published archival data I intend to use as the secondary reference data from the industry regulator's (NCC) web portal (website). The data analysis plan encapsulates how I intend to answer the

research questions and test the hypotheses. The data cleaning and screening strategy to ensure the correctness and consistency of the proposed data leads to explaining the mitigation plans for the perceived threat to external validity, internal validity, and construct validity. The ethical consideration section revealed my plan for protecting the study's proposed participants and the data protection and preservation strategy. Chapter 4 would capture the data analysis results, answer the research questions, and test the study hypotheses.

Chapter 4: Results

The purpose of this quantitative correlational study was to examine the relationship between PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos. The target population for this study included community members and leaders from three purposively selected local communities in Lagos State, Nigeria. The communities were Igbe-Ikorodu, Gowon Estate, and Idumagbo Avenue-Lagos Island (Adeniyi, Fagbenro & Olatona, 2019; Lagos State Government, 2012). The independent variables were PU, PB, PEoU, and PS, and the dependent variable was community members' and leaders' BI to allow BIID. The study could help the policymakers identify the possible mitigation factors that may improve broadband Internet penetration. The positive social change effect aligns with Ogunfuwa's (2017), and Elebeke's (2019) postulations that enhanced broadband Internet penetration translates to improved economic growth, poverty, and social vices reduction.

The available data answered the overarching research question. The RQ focused on the extent, if any, to which the independent variables PU, PEoU, PB, PS relate to community members' and leaders' BI to allow BIID at the local community level in Lagos (dependent variable). The research hypotheses were to predict the relationship or otherwise between the independent variable (PU, PEoU, PB, PS) and the dependent variable (community members' and leaders' BI to allow BIID) at the local community level. The hypothesis determined any statistically significant difference between the means of the independent variables (PU, PEoU, PB, PS) and community members' and leaders' BI to allow BIID at the local community. In this chapter, I describe the data

collection procedures and the study results through statistical analysis of the research questions and hypotheses.

Data Collection

I utilized primary data for this study. The prior data collection period spanned between March 1, 2021, to April 8, 2021. I collected the data using SurveyMonkey, an online survey tool. I posted the link to my survey questionnaire and the approved consent letter by the IRB to the WhatsApp platforms of the three selected communities using the community representatives who volunteered to help with posting the link. I sent the survey link to the targeted community platforms to the respondents who have access to the internet across the three communities of Gowon Estate—Alimosho, Igbe-Ikorodu, and Idumagbo Avenue—Lagos Island. I used the G*Power sample size computational tool to identify the required sample size of 129 respondents for the study based on an effect size of 0.15, error probability of 0.05 for a targeted statistical power of 0.95, and 4 as the total number of tested predictors. I applied Bowley's proportionate allocation formula, also used by Agbionu et al. (2018) and Ozomadu et al. (2019), to identify the required respondents from each of the three selected local communities. I opened the survey link for 10 days, and 168 respondents filled the survey. After performing the data cleaning exercise using the SPSS analysis tool, the valid responses were 144. The figure had 15 more responses than the calculated sample size representing a 112% survey completion rate.

The IRB had also given its approvals for the data collection strategy as indicated with approval number 02-26-21-0572141, expiring on February 25, 2022. Purposeful

sampling allows researchers to strategically select information-rich cases directly related to the study interest (Frankfort-Nachmias & Leon-Guerrero, 2018). Badmos et al. (2019) and Bamiteko and Adebiyi (2020) observed that the character traits from the three communities seem negatively disposed towards allowing the deployment of the broadband Internet infrastructure. The concern to know more illuminates the need to investigate the BIs of the community members and leaders. I could not correctly analyze the targeted influential community groups without understanding the demographics.

Study Demographics and Participants Analysis

The study instrument starts with participants' demographic information in Part I (Appendix A) and progresses into Part II (survey instrument). Part I was structured to gather unidentified participant's demographic information. It starts with the participants' gender information, the community of residence in Lagos State, age, highest educational qualification, community leader or member, and the use of some specific broadband Internet services.

Table 6

Respondents' Gender Classification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	89	61.8	61.8	61.8
	Female	55	38.2	38.2	100.0
	Total	144	100.0	100.0	

The output of Table 6 shows the respondents' gender classification. The Table indicates that 89 males representing 61.8% and 55 females representing 38.2%,

completed the survey out of 144 respondents. More males than females across the three selected local communities have access to basic mobile or fixed internet services and use voice, data, and video. It is, however, noteworthy that both genders participated in the survey.

Table 7

Respondents' Local Community of Residence in Lagos State

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Gowon Estate - Alimosho	112	77.8	77.8	77.8
	Igbe – Ikorodu	16	11.1	11.1	88.9
	Idumagbo - Lagos Island	16	11.1	11.1	100.0
	Total	144	100.0	100.0	

Table 7 indicates that 112 respondents representing 77.8% completed the survey at Gowon Estate–Alimosho, 16 respondents representing 11.1% for Igbe–Ikorodu, and 16 respondents representing 11.1% Idumagbo–Lagos Island. The Bowley's proportionate allocation formula, also used by Agbionu et al. (2018) and Ozomadu et al. (2019), suggested that 110 respondents complete the Gowon Estate survey Alimosho, 10 respondents for Igbe–Ikorodu, and nine respondents for Idumagbo Avenue–Lagos Island. The result depicts a satisfactory survey completion rate from the three selected local communities, limiting threats to external validity and Type I error. Burkholder et al. (2016) observed that a weak interaction of other observed causal relationships with sample units is a threat to external validity. Kelter (2020) argued that a deliberate effort at simultaneously increasing sample sizes in research limits Type I error rates. The

achievement of substantial calculated and allocated sample sizes to the different communities indicates a strong validity and reliability test criteria for the study.

Table 8

Respondents' Age Distribution

		Frequency	Percent	Valid percent	Cumulative percent
Valid	18-30	34	23.6	23.6	23.6
	31-45	96	66.7	66.7	90.3
	46-55	12	8.3	8.3	98.6
	56 and above	2	1.4	1.4	100.0
	Total	144	100.0	100.0	

Questions 4 to 8 requested the participants to indicate their age brackets, educational qualification, position in the local communities, and internet services knowledge to qualify as the study's stratified participants. Tables 8–11 represent the questions. Table 8 shows that 34 respondents representing 23.6% were between the ages of 18-30. Also, 96 respondents representing 66.7% were between the ages of 31-45, 12 respondents representing 8.3% were between the ages of 46-55, and 2 respondents representing 1.4% fall in the 56 years and above category. The analysis revealed that many youths (31-45) show more interest in and use of internet services across the three local communities.

Table 9 indicates that most respondents' educational qualification falls within the HND/BSC first degree levels. The Table shows that 88 respondents representing 61.1% of the sample population across the three local communities participated in the survey. Table 10 explains the position of the respondents in the local communities. The Table

shows that 51 respondents representing 35.4%, participated as community leaders while 135 respondents representing 93.8% as community members. Table 11 affirmed that the survey link got to the targeted respondents as intended and in the data collection plan. It is evident in the 100% participation rate of all respondents confirming the use of internet services (voice, data, and video) on either mobile or fixed platforms.

Table 9

Respondents' Educational Qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primary School Certificate	1	.7	.7	.7
	GCE/SSCE	11	7.6	7.6	8.3
	OND/NCE	17	11.8	11.8	20.1
	HND/BSC	88	61.1	61.1	81.3
	Master's Degree	25	17.4	17.4	98.6
	Doctorate Degree	2	1.4	1.4	100.0
	Total	144	100.0	100.0	

Table 10

Respondents' Position in the Local Community

I am a community leader

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	51	35.4	35.4	35.4
	No	93	64.6	64.6	100.0
	Total	144	100.0	100.0	

I am a community member.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	135	93.8	93.8	93.8
	No	9	6.3	6.3	100.0
	Total	144	100.0	100.0	

Table 11

Respondents' Knowledge of Internet Services

Do you use internet services (voice, data, video), either mobile or fixed?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	144	100.0	100.0	100.0

Study Results

The objective of chapter four is study results presentation. The results presentation leads to the interpretation of the findings, recommendation, and conclusion in chapter five. I will provide statistical assumptions and analyses of the research question. I used Pearson's correlation coefficient to determine how the variables of complexity thinking factors (PU, PB, PEoU, and PS) associated with the variable of broadband Internet penetration (community members' and leaders' BI to allow BIID at

the local community level in Lagos) from a holistic standpoint. Standard multiple linear regression analysis would precede Pearson's correlation analysis. Obinkyereh (2017) used a multiple linear regression analysis to test the hypotheses between the predictor variables and the outcome variable. I used standard multiple linear Regression, $\alpha = 0.05$, two-tailed to examine the extent to which PU, PB, PEoU, and PS predict community members' and leaders' BI to allow BIID at the local community level Lagos.

Ozomadu et al. (2019) observed that standard multiple regression analysis is an essential tool to determine the predictive power of the independent variables over the dependent variable. I concluded the analysis by using variance (ANOVA) analysis to compare the means of community members' BI to allow BIID from that of the community leaders. Wang, Huang et al. (2020) and Liu and Wang (2021) seem to align on the opinion that ANOVA helps researchers to determine if there are statistically significant differences between the means of two or more unrelated independent groups. The independent variables are PU, PB, PEoU, PS, and the dependent variable, community members' and leaders' BI, to allow BIID at the local community level in Lagos. The predictor variables model’s F-test, degrees of freedom, and p-values would determine the acceptance or rejection of the null hypothesis. I will progress logically with basic reliability checks, test assumptions of the multiple regressions' analysis, and conclude with the inferential statistics.

Reliability Analysis

The nature of social science research means that interested variables become increasingly challenging to measure, increasing the risk of measurement error (Plano

Clark & Ivankova, 2016). For instance, Sanders (2019) observed that unreliable measurement causes relationships to be under-estimated, increasing the risk of Type II errors in simple correlation and regression analyses. In the Regression or partial correlation, the effect sizes of variables could be over-estimated without reliable measurement of the covariate since it would not remove the effect. Most authors assume that reliability estimates (Cronbach Alphas) of .7-.8 are acceptable (Asimeng et al., 2020; Hu & Plonsky, 2021; Plano Clark & Ivankova, 2016; Sanders, 2019). But Sanders (2019) argued that the reliability scale of individual items with few items could range between .5 - .8. I decided to perform a reliability analysis for all the variables in the study.

I performed a reliability analysis for all variable items to ensure that the questions correlate with the constructs. The extracted Cronbach's Alpha for all the 17 variable items was 0.895 suggesting a strong reliability effect. Asimeng et al. (2020) and Hu and Plonsky (2021) are unanimous on the opinion that a Cronbach Alphas value of .7-.8 are acceptable estimates to suggest the reliability of data. The Cronbach's Alpha outcomes in Table 12 show the reliability statistics and case processing summary for all items. The case processing summary indicates that there are 144 respondents with reliable and valid responses to be used for the analyses in the study. The excluded values are 0, meaning a 100% case availability for investigations in the study. I present the comprehensive examination of data reliability statistics in Appendix C.

Table 12

Data Reliability Statistics and Case Processing Summary for All Items

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.895	.898	17

Case Processing Summary

		N	%
Cases	Valid	144	100.0
	Excluded[a]	0	.0
	Total	144	100.0

a. Listwise deletion based on all variables in the procedure.

I performed a detailed reliability analysis for all variable items testing the list of questions in the survey document relating to each variable to establish correlation among variable items. The reliability analysis on the 144 valid survey questions produced the acceptable Cronbach's Alpha value of .895 and the details are represented in Appendix C. I also presented the summary of the reliability statistics in Table 13.

Table 13

Summary of the Reliability Statistics/Variable

Items	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Perceived Usefulness	.810	.814	3
Perceived Ease of Use	.790	.788	4
Perceived Benefit	.776	.779	3
Perceived Security	.676	.677	4
BI for BIID	.681	.681	3

Tests of Assumptions

Chapter 3 stated that I should be using the multiple regression analysis to test if there is a relationship between the complexity thinking factors (PU, PEoU, PB, PS) and community members' and leaders' BI to allow BIID at the local community level in Lagos. Asimeng et al. (2020) listed five assumptions of the multiple regression analysis that researchers should test before performing multiple regression analyses. The assumptions are homoscedasticity, normality, linearity, multicollinearity, and independent observations. Hu and Plonsky (2021) argued that research results may suffer Type I or Type II errors, including over or under-estimations of significance if researchers ignore the assumptions. I will, therefore, check for possible violations of the premises to forestall biases and limited reliability and validity issues.

Homoscedasticity

It is a test of variance around the regression line. Homoscedasticity indicates that the conflict around the regression line is the same for all the values of the predictor variables. Hu and Plonsky (2021) observed no correlation between the independent variables when the Durbin Watson value is between 2 and 3. A value of 4 suggests that there is a correlation between the independent variables. There is an indication of Heteroscedasticity when the variance of errors differs between the different values of the independent variables. Table 14 indicates that the Durbin Watson value is 1.939, and it confirms that there exists no correlation among residuals indicating that it meets the homoscedasticity assumption.

Table 14

Model Summary of Dubin-Watson Test of Homoscedasticity Model Summary[b]

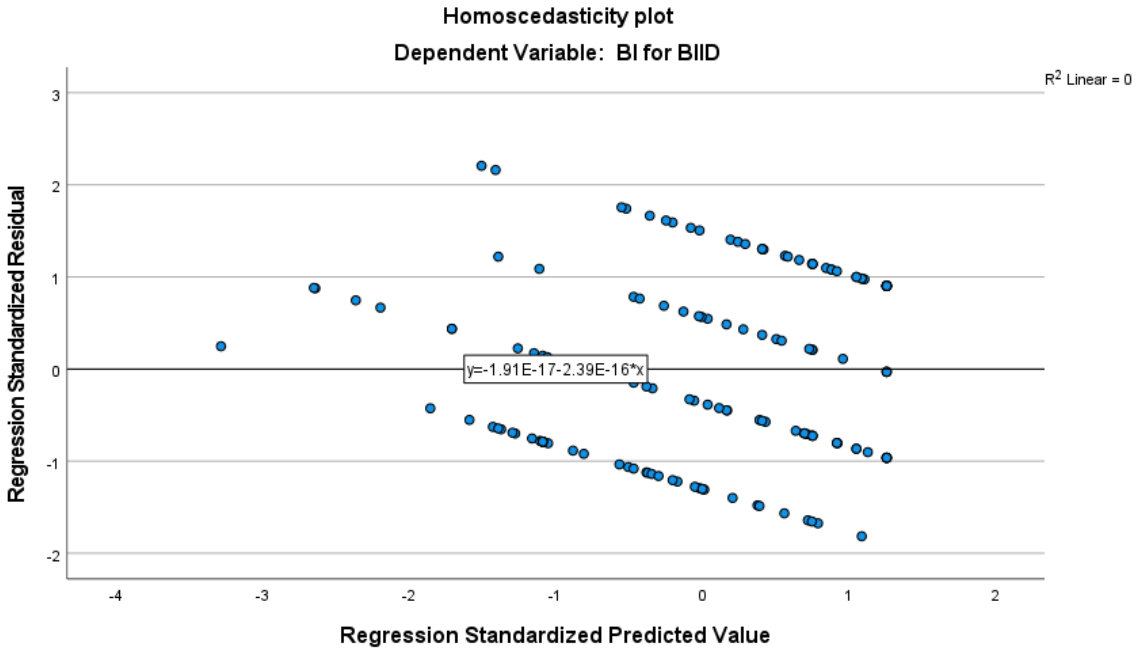
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.755[a]	.570	.558	.32159	1.939

a. Predictors: (Constant), PS, PU, PB, PEoU
b. Dependent Variable: BI for BIID

Also, notice the same relationship in Figure 8, showing evenly scattered plots around the regression line. Notice that the variance of the residuals is homogeneous across levels of the predicted values. The relationship between community members' and leaders' BI for BIID and PU, PEoU, PB, PS is zero since the residuals seem randomly scattered around zero.

Figure 8

Homoscedasticity Plot



Multicollinearity

The multicollinearity assumption tests for highly related predictors and are predictive of the outcome to avoid problems of estimating the regression coefficients (Sanders, 2019). Gorard (2021) observed that multicollinearity occurs when more than two variables linearly combine. The fear is that as the degree of multicollinearity increases, it affects the stability of the coefficient estimates and can inflate the standard errors for the coefficients.

I used 144 respondents as the sample population of the study. The figure is higher than the calculated sample of 129 required for the research. The need to check for multicollinearity within the collected data was to avoid estimating the regression

coefficients. Sanders (2019) suggests that researchers should use both the correlation coefficient and variance inflation factors (VIF) to verify multicollinearity. Table 24 shows the Pearson Correlation displaying the bivariate correlation matrix among variables. Notice that the bivariate correlation matrix among the variables is less than 0.8. Gorard (2021) opined that multicollinearity becomes feasible at the 0.9 or higher level of a correlation coefficient. Table 24 shows the absence of multicollinearity among the predictors' constructs. The Table shows that the highest correlation was between PEoU and PB at 0.708 < 0.9. Therefore, there is no multicollinearity concern among the variables. Alternatively, I decided to run a confirmation analysis and depicted the results in Table 15. The general rule is for the Tolerance value to be higher than 0.2 and VIF values to be under 10 (Gorard, 2021). All the independent variables in Table 15 meet the assumption of multicollinearity

Table 15

Coefficients of Collinearity Diagnostics Between Perceived Usefulness, Perceived Ease of Use, Perceived Benefit, and Perceived Security

Multicollinearity Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	Perceived Usefulness (PU)	.513	1.948
	Perceived Ease of Use (PEoU)	.324	3.088
	Perceived Benefit (PB)	.477	2.098
	Perceived Security (PS)	.549	1.823

a. Dependent Variable: BI for BIID

Normality, Linearity, and Outliers Test

It is essential to be attentive to the effect of a single observation on other observations in a distribution. An observation that is substantially different from all others could significantly impact the results of the regression analysis (Hu & Plonsky, 2021). An outlier is an observation more minor in a group that substantially affects the results, and it would be necessary to subject such an observation to further investigation. More so, Regression assumes normal distribution for variables. Asimeng et al. (2020) argued that highly skewed, non-normal, or kurtotic variables distributed with notable outliers could distort the outcome of the analysis and significance tests. Normality tests are done by the Kolmogorov – Smirnov (K-S) test and Shapiro – Wilk (S-W) test. The author advised researchers to get information about the normality of data distribution through visual inspection of data plots. Others are skewness, kurtosis, and P-P plots. Gorard (2021) also supported that researchers can identify outliers by visually inspecting histograms, frequency distributions or by converting data to z-scores.

Traditionally, multiple Regression should accurately estimate the relationship between dependent and independent variables in a linear relationship. However, Frankfort-Nachmias and Leon-Guerrero (2018) observed that several instances negate the assumption of linearity in social sciences. Crowell and Boynton (2020) also argued that life-threatening, non-linear situations require complex adaptability. It is, therefore, crucial that researchers examine analyses for non-linearity. If the relationship between the predictor variables and the outcome variable is not linear, the regression analysis results could be underestimating the genuine connection. The error of estimation increases the

chances of a Type II error for the independent variables. In the case of multiple Regression, it could increase the risk of Type I errors for other independent variables that share variance (Sanders, 2019). I will further demonstrate the assumption of normality, linearity, and outliers by displaying some plots of my data distribution

Figure 9 is a scatter plot matrix to test for the presence of a non-linear relationship between the complexity thinking factors of PU, PEoU, PB, PS, and the broadband Internet factor of BI for BIID. The plot shows the absence of unusual patterns, suggesting that the relationship between the predictor and outcome variables is linear. Notice that the histograms are for the variables on the Y-axis and the lines move from bottom-up. It indicates strong positive correlations among the variables. Sanders (2019) opined that the scatter plot matrix reveals relationships among variables rather than causality. The plot also shows the lack of outliers, as further demonstrated in Table 16.

Figure 9

Plot to Test for the Existence of a Nonlinear Relationship

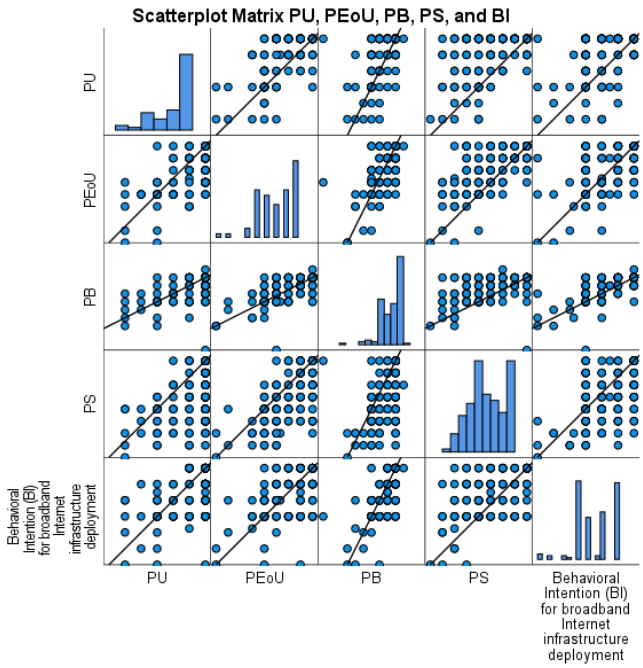


Table 16 shows the standardized residuals as a basis for identifying outliers using simple linear Regression. The primary indicator in the Table is that the unstandardized residuals, the standardized predicted values, and standardized have a mean of zero. It, therefore, meets the assumption that the residuals are normally distributed with a mean-centered around zero.

Table 16

Testing for Outliers

Residuals Statistics Testing for Outliers[a]

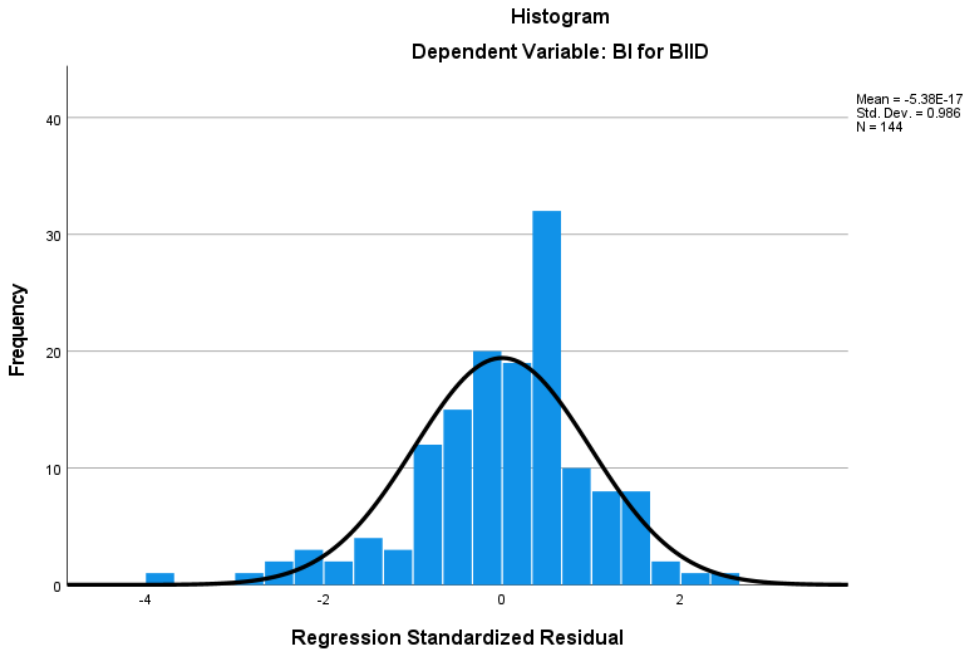
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.3011	4.9009	4.4360	.36537	144
Residual	-1.20423	.76403	.00000	.31706	144
Std. Predicted Value	-3.106	1.272	.000	1.000	144
Std. Residual	-3.745	2.376	.000	.986	144

a. Dependent Variable: BI for BIID

Figure 10 further indicates that the distribution meets the assumption of normality. Physical inspection shows that the histogram graph has an approximate shape of a normal curve. The bell shape output of the graph shows that the distribution is normally distributed.

Figure 10

Histogram Showing Normal Distribution



Similarly, the normal Q-Q plot in Figure 11 and the normal probability plot for the regression residual also depict the normality of distribution. Hu and Plonsky (2021) argued that the dots of the normal Q-Q plots should exactly on the line for perfect normality or around the regression line for approximately normal distribution of the data. The plots show that the dots are around the line and in the same direction as the line. Physical observation shows that the plots are patterned in a specific direction indicating the absence of an outlier The observation supports the assumption of normality.

Also, notice the same relationship in Figure 9, showing evenly scattered plots around the regression line. Notice that the variance of the residuals is homogeneous across levels of the predicted values. The relationship between community members' and

leaders' BI for BIID and PU, PEoU, PB, and PS is zero since the residuals seem randomly scattered around zero.

Figure 11

Normal Q-Q Plot for Behavior Intention for Broadband Internet Infrastructure Deployment

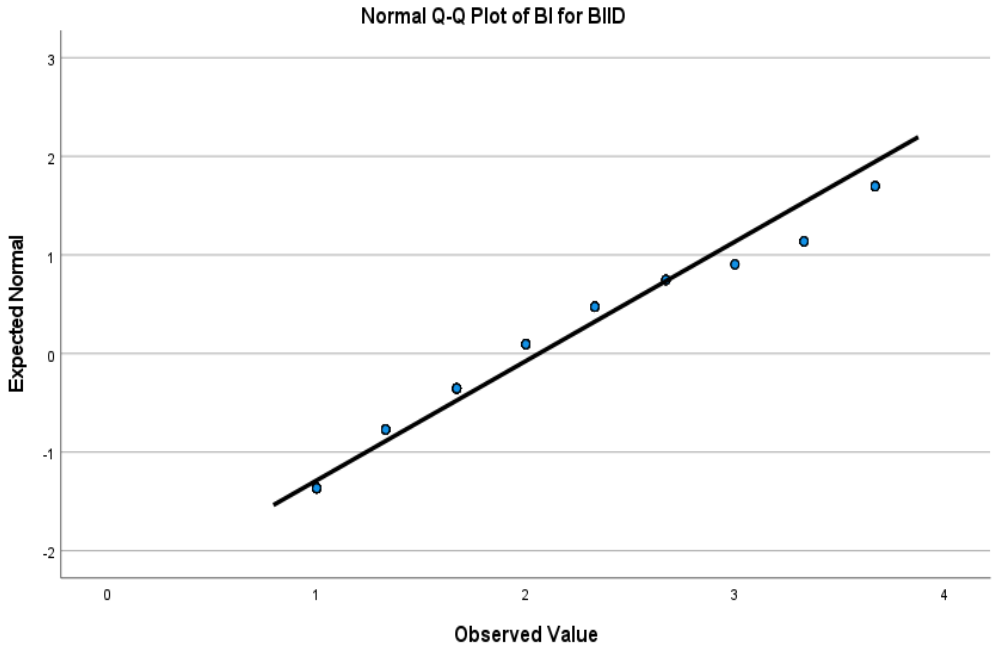


Figure 12

Normal Probability Curve for Regression Standardized Residual

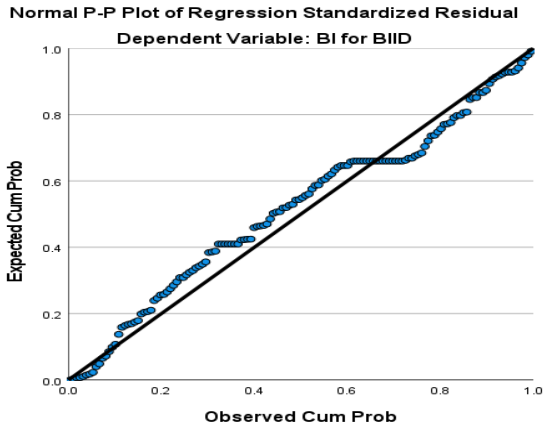


Table 21 is the Test of normality showing the p-value of significance for PU, PEoU, PB, PS, and BI, indicating $p < 0.5$ for both Kolmogorov-Smirnov and Shapiro-Wilk test results. Therefore, it is correct to accept the null hypothesis that the scores of PU, PEoU, PB, PS, and BI for BIID are not normally distributed. However, Crowell and Boynton (2020) suggested a detailed exploration of other measurement criteria before making conclusions. Hence, the visual inspection of the histograms and the normal Q-Q plots in figures 10 and 11 showed that the score of the community members and leaders' BI for BIID were approximately normally distributed. More so, considering the scatterplot matrix in Figure 9 and the mean of unstandardized residuals and standardized predicted values in Table 16, the residuals are normally distributed around the zero axes with insignificant deviation.

Table 17

K-S and S-W Tests of Normality for All Variables

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PU	.334	144	.000	.723	144	.000
PEoU	.180	144	.000	.882	144	.000
PB	.219	144	.000	.821	144	.000
PS	.137	144	.000	.930	144	.000
BI for BIID	.170	144	.000	.872	144	.000

a. Lilliefors Significance Correction

More so, the descriptive statistics of skewness and kurtosis in Table 22 show that the data met the normality assumption. Bastianin (2020) advised researchers to use the z-value of -1.96 and +1.96 by dividing the skewness and kurtosis values by the SE if the data sample is < 50. However, the author recommended liberal z – range values of -3.29 and +3.29 as a reference score for skewness. Bastianin pegged the absolute kurtosis range at ±10 for larger samples. In the analysis of the normality test in Table 18, the variables of the dependent and independent constructs fell within the recommended measures of normality. The descriptive statistical computation of the values of skewness and kurtosis in Table 18 demonstrated the variables PU, PEoU, PB, PS, and BI stippled within the range of -1.322 to -.533 (- 3 < -1.387, -.102 < +3), and the kurtosis values .754 to 3.047 (-10 < .754, 3.047 < +10).

Table 18

Descriptive Statistics of Skewness and Kurtosis

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
PU	144	3.33	5.00	4.6759	.46467	-1.322	.202	.754	.401
PEoU	144	3.00	5.00	4.4971	.46157	-.753	.202	.295	.401
PB	144	2.00	5.33	4.5370	.52905	-1.372	.202	3.047	.401
PS	144	3.00	5.00	4.2604	.53780	-.102	.202	-.990	.401
BI for BIID	144	3.00	5.00	4.4360	.48376	-.533	.202	-.067	.401
Valid N (listwise)	144								

The review of the descriptive statistics table for skewness and kurtosis demonstrates the normality of the available data for further analysis, as indicated in chapter 3. Meeting the various multiple regression assumptions is a testament that I have substantially resolved potential reliability and validity concerns have to leave no room for further transformation. Asimeng et al. (2020) and Bastianin (2020) aligned on the thought that insignificant variation resulting in a few deviations from the desired statistical assumptions do not constitute violations. The authors concluded that survey efficiencies and data generated should be valid and reliable, with sample sizes more significant than 100 participants (N > 100). It is interesting to note that the calculated sample size for the study was 129 participants, but I got 144 valid responses. It is, therefore, essential to note

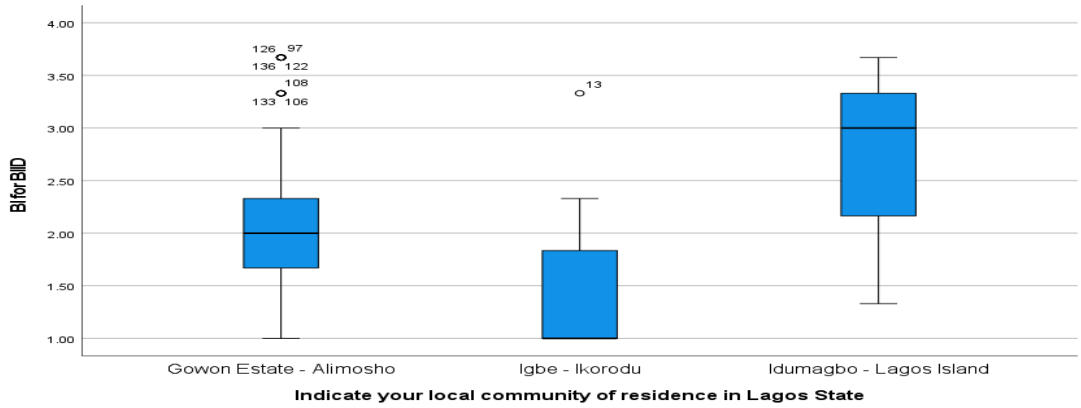
that Pearson's correlation coefficient and multiple linear regression analysis may reveal a few deviations from the projected normality assumptions. Such variations are expected and would be considered insignificant.

Independence of Observations

The expectation is that errors associated with one observation should not correlate with the mistakes of other observations (Gorard, 2021). The author argued that the violation of the assumption of independence of observations occurs under different scenarios. For instance, data collection from schools in a similar district may show some similarities, making it possible for the errors not to be independent. Asimeng et al. (2020) advised that researchers should observe that the mean standardized residual is distributed around zero for all districts and to note if the variances are homogenous across districts. Figure 12 shows that the communities have different mean values of the dependent variable. The communities display variability in the BI means values. It suggests that the data meets the observation because possible observation errors are not independent.

Figure 13

Boxplot to Indicate the Independence of Observation Across Community of Residence



Comparison of the Means of Community Members' Behavior Intention from Community Leaders

Tables 19 – 21 display the descriptive statistics of the means of the community member and leader and the respective groups. Levene's Test of Equality of variance and the tests of between-subjects effects. Table 19 shows the highest mean value μ (2.5714) for Leader's "Yes" and member's "No" and the lowest mean value μ'(1.9634) for Leader's "No" and member's "Yes."

Table 19

Descriptive Statistics of Leader and Member

Dependent Variable: BI for BIID

Leader	Member	Mean	Std. Deviation	N
Yes	Yes	2.1895	.87266	44
	No	2.5714	1.06848	7
	Total	2.2420	.89974	51
No	Yes	1.9634	.77864	91
	No	2.0000	.00000	2
	Total	1.9642	.77015	93
Total	Yes	2.0371	.81419	135
	No	2.4444	.95902	9
	Total	2.0626	.82609	144

Levene's Test for equality of variance in Table 20 indicates equality of variance across groups at P (.062, .150, and .151). Levene tests the null hypothesis that the error variance of the dependent variable is equal across groups (Warner, 2020). Therefore, it is correct to accept the null hypothesis of equality of variance. The confirmation of any possible violation of Levene's test assumption is by carrying out further analysis using the two-way ANOVA.

Table 20

Levene's Test of Equality of Error Variances Between Community Member and Leader

		Levene Statistic	df1	df2	Sig.
BI	Based on Mean	2.502	3	140	.062
	Based on Median	1.798	3	140	.150
	Based on Median and with adjusted df	1.798	3	129.297	.151
	Based on trimmed mean	2.443	3	140	.067

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: BI

b. Design: Intercept + leader + member + leader * member

Table 21 is the Test of between-subjects effects (Two-Way ANOVA) of community leaders and members. The Table shows that both community leaders' and members' responses do not significantly impact BIID BIID at p = .239 and .536, respectively. Also, notice that both community leader and member interaction combined do not have a significant effect on BIID at p = .610. The Partial Eta Squared presents the percentage of variation that explains the BI of community leaders and members. The leader alone explained 1% of the variation in the BI score, the member explained 0.3% in the BI score, and the combination of leader and member explained 0.2% of the variation in the BI score. So, the leader explained the highest percent of the variability in the BI score.

Table 21

Tests of Between-Subjects Effects Leader and Member (Two-Way ANOVA)

Dependent Variable: BI for BIID						
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3.425[a]	3	1.142	1.697	.170	.035
Intercept	112.500	1	112.500	167.266	.000	.544
Leader	.940	1	.940	1.398	.239	.010
Member	.259	1	.259	.385	.536	.003
Leader * Member	.176	1	.176	.262	.610	.002
Error	94.162	140	.673			
Total	710.190	144				
Corrected Total	97.586	143				

a. R Squared = .035 (Adjusted R Squared = .014)

Table 22

*Leader * Member Profile Interaction Table*

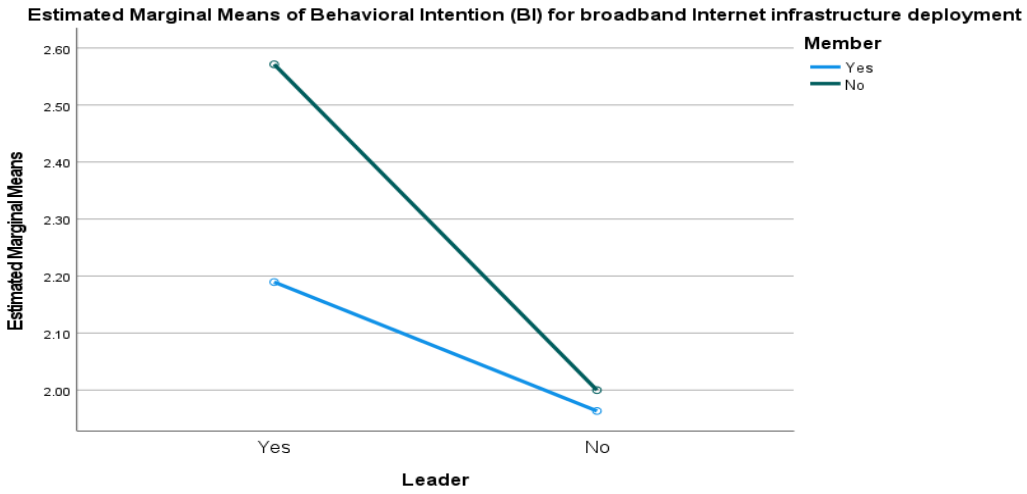
Dependent Variable: BI for BIID					
			Std. Error	95% Confidence Interval	
Leader	Member	Mean		Lower Bound	Upper Bound
Yes	Yes	2.190	.124	1.945	2.434
	No	2.571	.310	1.959	3.184
No	Yes	1.963	.086	1.793	2.133
	No	2.000	.580	.853	3.147

The profile plots in Figure 13 indicate a significant interaction effect at the point of intersection of the lines (Hu & Plonsky, 2021; Rahman & Sathi, 2020). There is no intersection of the lines in the profile plot. So, there is no significant interaction effect

between the mean of the community members and the leader's interaction effect on their responses to the BI questions.

Figure 14

Leader and Member Profile Plots



The plot also aligns with the details in Table 22 showing the difference in the response pattern of community members and leaders as indicated by the variations in the mean values. The profile plot in Figure 13 and the measurement of the members' and leaders' interaction in Table 22 confirmed independent responses across the three local communities. The finding also satisfies the assertion in chapter 3 that the communities are not related but selected based on certain behavioral traits towards the acceptance of technology infrastructure deployment.

Inferential Statistics Results

My goal was to use the TAM model to analyze the relationship between the complexity thinking factors (PU, PEoU, PB, PS) and broadband Internet penetration

operationalized as community members' and leaders' BI to allow BIID at the local community level in Lagos.

Research Questions and Hypotheses

RQ: How do PU, PEoU, PB, PS relate to community members' and leaders' BI to allow BIID at the local community level in Lagos?

H_0: There is no relationship between PU, PEoU, PB, PS, and community members' and leaders' BI to allow BIID at the local community level in Lagos.

H_A: There is a relationship between PU, PEoU, PB, PS, and community members' and leaders' BI to allow BIID at the local community level in Lagos?

Table 23

Descriptive Statistics of Pearson Correlation

	Mean	Std. Deviation	N
PU	4.6759	.46467	144
PEoU	4.4971	.46157	144
PB	4.5370	.52905	144
PS	4.2604	.53780	144
BI for BIID	4.4360	.48376	144

Table 23 is the output of the descriptive statistics of the model showing the mean, the standard deviation, and the number of the distribution. The Pearson correlation coefficients matrix in Table 24 explains the association between the complexity thinking factors (PU, PEoU, PB, PS) and BI for BIID.

Table 24

Pearson Correlations Matrix of Complexity Thinking Factors and Behavioral Intention

	PU	PEoU	PB	PS	BI
Perceived Usefulness (PU)		.671**	.602**	.489**	.513**
Perceived Ease of Use (PEoU)			.701**	.669**	.586**
Perceived Benefit (PB)				.496**	.708**
Perceived Security (PS)					.575**

**. Correlation is significant at the 0.01 level (2-tailed).

Table 24 shows that all the variables are positively related; PU has a very strong positive correlation and statistically significant with PEoU ($r = .671$, $p < 0.01$), and very strong positive and statistically significant with PB ($r = .602$, $p < 0.01$). It has a moderate positive correlation and statistically significant with PS ($r = .489$, $p < 0.01$), and a strong positive and statistically significant with BI ($r = .513$, $p < 0.01$). PEoU has a very strong positive correlation and statistically significant with PB ($r = .701$, $p < 0.01$), and very strong positive and statistically significant with PS ($r = .669$, $p < 0.01$). It also has a strong positive and statistically significant correlation with BI ($r = .586$, $p < 0.01$).

PB has a moderate positive and statistically significant correlation with PS ($r = .496$, $p < 0.01$), and a very strong positive and statistically significant correlation with BI ($r = .708$, $p < 0.01$). PS correlation is as stated with the other variables except that it has a strong positive and statistically significant correlation with BI ($r = .575$, $p < 0.01$). The

analysis indicates that all the variables (PU, PEoU, PB, PS, and BI) have *p*-values of .000, much less than the 0.05 and .001 conventional thresholds. Overall, the Table indicates a strong positive correlation between the complexity thinking factors ($p < .001$). The result becomes much explicit with further analysis. These analyses include simple regression analysis for the understanding of the influence of each of the independent (PU, PEoU, PB, PS) variables in a bivariate relationship with the dependent variable (BI for BIID).

Bivariate Regression Analysis

I started this section by conducting simple regression analyses using all the independent variables to examine the outcome of the dependent variable. Simple regression predicts the outcome of one independent variable while multiple regression guesses the outcome of two or more variables (Gordon, 2020). The following analyses show each of the variables in bivariate relationships.

Perceived Usefulness and Behavioural Intention to Allow Broadband Internet Infrastructure Deployment

Research Questions and Hypotheses

RQ: How does PU relate to community members' and leaders' BI to allow BIID at the local community level in Lagos?

H_0: There is no relationship between PU and community members' and leaders' BI to allow BIID at the local community level in Lagos.

H_A: There is a relationship between PU and community members' and leaders' BI to allow BIID at the local community level in Lagos.

Otika et al. (2019) discoursed that the large R, or multiple R, in a bivariate regression model is most times the same as the Pearson correlation coefficient. Table 25 reveals an R statistic value of .513. The R-value is like the correlation coefficient value of PU and BI for BIID in Table 24. Indicating that the Pearson correlation coefficient between PU and BI for BIID has a statistical R-value of .513. The R^2 statistic was .263 translating to 26% of more information about the overall model. Therefore, I infer that only 26% of PU accounted scale of the BI for BIID. The adjusted R^2 is .258 while the standard error of the overall estimate is .41694.

Table 25

Model Summary of Perceived Usefulness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.513[a]	.263	.258	.41684

a. Predictors: (Constant), Perceived Usefulness (PU)

Table 26 is the ANOVA table testing for the overall significance of the regression model for PU and BI for BIID. The table shows a significance level of .000, well below the conventional 0.05 alpha level. Therefore, the PU and BI for BIID model have statistical significance. However, further analysis in Table 27 may be required to reveal the degree or the strength of the relationship.

Table 26

ANOVA Perceived Usefulness a

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	8.792	1	8.792	50.601	.000[b]
	Residual	24.674	142	.174		
	Total	33.466	143			

a. Dependent Variable: BI for BIID

b. Predictors: (Constant), PU

Table 27 is the coefficient table that shows the constant where the slope of the regression line intercepts with the Y-axis (Liu & Wang, 2021). The regression model for PU and BI for BIID F (1, 142) = 50.601, p = .000 and β =.534, beta = 513, t =7.113, p =.000 and revealed that there was a significant relationship between PU and BI for BIID. The p<.005 suggests a significant relationship between PU and BI for BIID. The coefficient table provides detailed information on the relationship between PU and BI for BIID. The unstandardized coefficient shows that for every additional perception of the usefulness of broadband Internet, the scale of the BI for BIID will rise by .534 units on average, translating to a 53.4% change in the scale of BI for BIID. The beta value equals the Pearson coefficient .513 because the standardized coefficient homogenizes the units of measure. Notice also that the table shows a significance at p= .000 less than the 0.05 threshold. It is, therefore, correct to reject the null hypothesis that there is no relationship between PU and community members' and leaders' BI to allow BIID. Consequently, I accept the alternative hypothesis that there is a relationship between PU and BI to allow BIID. The overall conclusion is that PU has a strong influence on community members' and leaders' BI to allow BIID at the local community level in Lagos.

Table 27

Coefficients Perceived Usefulness a

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	1.941	.352		5.506	.000
	Perceived Usefulness (PU)	.534	.075	.513	7.113	.000

a. Dependent Variable: BI for BIID

Perceived Ease of Use and Behavioural Intention to Allow Broadband Internet Infrastructure Deployment

Research Questions and Hypotheses

RQ: How does PEoU relate to community members' and leaders' BI to allow BIID at the local community level in Lagos?

H_0: There is no relationship between PEoU and community members' and leaders' BI to allow BIID at the local community level in Lagos.

H_A: There is a relationship between PEoU and community members' and leaders' BI to allow BIID at the local community level in Lagos.

Table 28 is the model summary for PEoU and shows an R statistic value of .586. similar to the correlation coefficient value of PEoU and BI for BIID in Table 24. The R^2 statistic was .343 translating to 34% of more information about the overall model. Therefore, only 34% of PEoU explained the scale of the BI for BIID. The adjusted R^2 is .338 while the standard error of the overall estimate is .39347.

Table 28

Model Summary of Perceived Ease of Use

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.586[a]	.343	.338	.39347

a. Predictors: (Constant), Perceived Ease of Use (PEoU)

Table 29 is the ANOVA table testing for the overall significance of the regression model for PEoU and BI for BIID. The table indicates a significance level of .000, well below the conventional 0.05 alpha level. Therefore, the PEoU and BI for BIID model have statistical significance. However, further analysis in Table 30 may be required to unravel the degree or the strength of the relationship.

Table 29

ANOVA Perceived Ease of Use

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	11.481	1	11.481	74.157	.000[b]
	Residual	21.985	142	.155		
	Total	33.466	143			

a. Dependent Variable: BI for BIID

b. Predictors: (Constant), PEoU

Table 30 is the coefficient table showing the final regression model for PEoU and BI for BIID F (1, 142) = 74.157, p = .000 and β =.614, beta = 586, t =8.611, p =.000 indicating that there was a significant relationship between PEoU and BI for BIID . The p<.005 suggests a significant relationship between PEoU and BI for BIID. The coefficient Table stipulates additional information on the relationship between PEoU and BI for BIID. The unstandardized coefficient confirms that for every additional perception

of ease of use of broadband Internet, the scale of the BI for BIID will increase by .614 units on average or a 61.4% change in the scale of BI for BIID. The beta value is the same as the Pearson coefficient .586 because the standardized coefficient normalizes the units of measure. The table also confirms a significance at *p*= .000 less than the 0.05 alpha threshold. Therefore, I reject the null hypothesis that there is no relationship between PEoU and community members' and leaders' BI to allow BIID. Conversely, I accept the alternative hypothesis that there is a relationship between PEoU and BI to allow BIID. The overall conclusion is that PEoU has a very strong influence on community members' and leaders' BI to allow BIID at the local community level in Lagos.

Table 30

Coefficients Perceived Ease of Use a

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	1.675	.322		5.198	.000
	Perceived Ease of Use (PEoU)	.614	.071	.586	8.611	.000

a. Dependent Variable: BI for BIID

Perceived Benefit and Behavior Intention to Allow Broadband Internet Infrastructure Deployment

Research Questions and Hypotheses

RQ: How does PB relate to community members' and leaders' BI to allow BIID at the local community level in Lagos?

H_0: There is no relationship between PB and community members' and leaders' BI to allow BIID at the local community level in Lagos.

H_A: There is a relationship between PB and community members' and leaders' BI to allow BIID at the local community level in Lagos.

Table 31 is the model summary for PB and reveals an R statistic value of .708. comparable to the PB and BI for BIID in Table 24. The R^2 statistic was .502 explaining 50% of more information about the overall model. Therefore, only 50% of PB accounted for the scale of the BI for BIID. The adjusted R^2 is .498 and the standard error of the overall estimate is .34262.

Table 31

Model Summary of Perceived Benefit

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.708[a]	.502	.498	.34262

a. Predictors: (Constant), PB

Table 32 is the ANOVA table testing for the overall significance of the regression model for PB and BI for BIID. The table denotes a significance level of .000, below the traditional 0.05 alpha level. Hence, the PB and BI for BIID model have statistical significance. Nevertheless, further analysis in Table 32 provides more insights into the degree of the relationship.

Table 32

ANOVA Perceived Benefit a

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	16.796	1	16.796	143.081	.000[b]
	Residual	16.669	142	.117		
	Total	33.466	143			

a. Dependent Variable: BI for BIID

b. Predictors: (Constant), PB

Table 33 is the coefficient table showing the final regression model for PB and BI for BIID F (1, 142) = 143.081, p = .000 and β =.648, beta = 708, t =11.962, p =.000 demonstrating the presence of a significant relationship between PB and BI for BIID. The p<.005 implies a significant relationship between PB and BI for BIID. The coefficient Table stipulates additional information on the relationship between PB and BI for BIID. The unstandardized coefficient reveals that for every additional perception of benefit of broadband Internet, the scale of the BI for BIID will change positively by .648 units, describing a 65.4% change in the scale of BI to allow BIID. The beta value equals the Pearson coefficient .708 because the standardized coefficient regularizes the units of measure. The table also sanctions significance at p= .000 less than the 0.05 alpha threshold. Consequently, I reject the null hypothesis that there is no relationship between PB and community members' and leaders' BI to allow BIID. On the contrary, I accept the alternative hypothesis that there is a relationship between PB and BI to allow BIID. The general conclusion is that PB has a very strong impact on community members' and leaders' BI to allow BIID at the local community level in Lagos.

Table 33

Coefficients Perceived Benefit a

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	1.497	.247		6.051	.000
	Perceived Benefit (PB)	.648	.054	.708	11.962	.000

a. Dependent Variable: BI for BIID

Perceived Security and Behavior Intention to Allow Broadband Internet Infrastructure Deployment

Research Questions and Hypotheses

RQ: How does PS relate to community members' and leaders' BI to allow BIID at the local community level in Lagos?

H_0: There is no relationship between PS and community members' and leaders' BI to allow BIID at the local community level in Lagos.

H_A: There is a relationship between PS and community members' and leaders' BI to allow BIID at the local community level in Lagos

Table 34 is the model summary for PS and shows an R statistic value of .575. the as the Pearson correlation coefficient for PS and BI for BIID in Table 24. The R^2 statistic was .331 clarifying 33% of more information about the overall model. Thus, only 33% of PS explained the scale of the BI for BIID. The adjusted R^2 is .326 and the standard error of the overall estimate is .39706.

Table 34

Model Summary of Perceived Security

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.575[a]	.331	.326	.39706

a. Predictors: (Constant), PS

Table 35 is the ANOVA table testing for the overall significance of the regression model for PS and BI for BIID. The table implies a significance level of .000, below the usual 0.05 alpha level. Consequently, the PS and BI for BIID model have statistical significance. Further analysis in Table 36 offers more understandings of the strength of the relationship.

Table 35

ANOVA Perceived Security a

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	11.079	1	11.079	70.274	.000[b]
	Residual	22.387	142	.158		
	Total	33.466	143			

a. Dependent Variable: BI for BIID
b. Predictors: (Constant), PS

Table 36 is the coefficient table displaying the final regression model for PS and BI for BIID F (1, 142) = 70.274, p = .000 and β =.518, beta = 575, t =8.383, p =.000 signifying the presence of a significant relationship between PS and BI for BIID. The p<.005 suggests a significant relationship between PS and BI for BIID. The coefficient Table specifies further information on the relationship between PS and BI for BIID. The unstandardized coefficient discloses that for every additional perception of security of

broadband Internet, the scale of the BI for BIID will increase by .518 units, indicating a 52% change in the scale of BI to allow BIID. The beta value is similar to the Pearson coefficient .575 because the standardized coefficient standardizes the units of measure. The table also measures significance at *p*= .000 less than the 0.05 alpha edge. Therefore, I reject the null hypothesis that there is no relationship between PS and community members' and leaders' BI to allow BIID. On the other hand, I accept the alternative hypothesis that there is a relationship between PS and BI to allow BIID. The overall conclusion is that PS has a strong effect on community members' and leaders' BI to allow BIID at the local community level in Lagos.

Table 36

Coefficients Perceived Security [a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	2.231	.265		8.415	.000
	Perceived Security (PS)	.518	.062	.575	8.383	.000

a. Dependent Variable: BI for BIID

It is important to note that bivariate analysis or simple linear regression only provides insights on the impact of individual variables (Plano Clark & Ivankova, 2016; Sanders, 2019). Sanders (2019) argued that linear regression only underestimates standard errors (SEs) and overestimates the p-value that may result in type I error. Frankfort-Nachmias and Leon-Guerrero (2018) also opined that researchers should use confounding variables as a control variable to check the relationships between dependent

and independent variables. The possible existence of spurious or confounded relations between the dependent and independent variables motivates researchers to adopt multiple regression models to understand the variable that best predicts the dependent variable. Given the suggestions, the concern for a type I error, and the objective of the study, I decided to embark on further analysis using multiple regression analysis.

Multiple Regression Analyses

The weaknesses of the bivariate regression analysis were the sole motivation to conduct a multiple regression analysis to test the relationship between the independent variables (PU, PEoU, PB, PS) and the dependent variable (BI to allow BIID). Multiple regression analysis begins with the explanation of the model concerning all the predictors (Rahman & Sathi, 2020). The proposed statistical model for this study is BI to allow BIID = $\alpha + \beta1*PU + \beta2*PEoU + \beta3*PB + \beta4*PS$. SPSS was used to conduct a full multiple regression analysis with the combination of all the predictors to identify the variable that has a stronger predictive strength on BI to allow BIID. The analysis produced an output of the combined model summary (Table 37), combined ANOVA (Table 38), and coefficient (Table 39). Gordon (2020) observed that the large R-value for the multiple correlation coefficient between the independent and dependent variables suggests the strength of relationships between the variables.

Table 37 displays the collective model summary for the multiple regression and the final equation model extrapolated from the coefficient Table 39 and BI to allow BIID = .897 + (.065 *PU) - (.047*PEoU) + (.506* PB) + (.270* PS). Notice that the combined multiple regressions R-value has a statistical value of .755. The adjusted R^2 signifies that

56% of the variability in a respondents' BI to allow BIID is explained by the combination of respondents' PU, PEoU, PB, and PS. The adjusted R^2 is not the same as the R^2 because of the use of multiple predictors (Gordon, 2020). The standard error of the estimate is .32159.

Table 37

Model Summary for Collective Independent Variables b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.755[a]	.570	.558	.32159

a. Predictors: (Constant), PS, PU, PB, PEoU
b. Dependent Variable: BI for BIID

Table 38 is the combined ANOVA table for the multiple regression model. Rahman and Sathi (2020) argued that a one-way ANOVA is an omnibus test statistic and is unable to demonstrate how specific groups or variables are significantly unique from the other variables. The ANOVA table indicates that at least two groups are different. I found significant multiple regression equation models using the ANOVA (Table38), $F(4, 139) = 46.147$, $p = .000$ with an adjusted R^2 of 0.558. The value as calculated in the model summary Table 37 revealed that the collective independent variables explained 56% of BI to allow BIID. A further analysis shall reveal the degree or the strength of the relationship of each variable in the model after adjusting for confounders.

Table 38

ANOVA for Collective Independent Variables a

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	19.090	4	4.773	46.147	.000[b]
	Residual	14.375	139	.103		
	Total	33.466	143			

a. Dependent Variable: BI for BIID

b. Predictors: (Constant), PS, PU, PB, PEoU

Table 39 is the coefficient table and provided a holistic analysis of the outcome of each of the independent variables. The table showed that PU has a low beta value of -.065 suggesting that PU has a none significantly weak relationship with BI to allow BIID at $p = .420$ greater than the .05 alpha threshold. The table also revealed that PEoU has a negative beta value of -.045 indicating that PEoU has a negative and nonsignificant relationship with BI to allow BIID at a p-value .645 much greater than the conventional alpha level of .05. The result is however different from PB which has a beta value of .553, p=.000<p=.05 indicating a strong positive and significant relationship between PB and BI to allow BIID. Similarly, PS has a beta value of .300, p=.000<p=.05 suggesting a moderate positive and statistically significant relationship between PS and BI to allow BIID. Therefore, I did not reject the hypothesis concerning PU and PEoU. The analysis confirmed that perception is a predictor of BI to allow BIID at the local community in Lagos. However, perceived benefit and PS are significant predictors of community members' and leaders' BI to allow broadband Internet deployment at the local community level in Lagos.

Table 39

Coefficients for Collective Independent Variables a

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations		
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part
1	(Constant)	.897	.298		3.015	.003			
	PU	.065	.081	.063	.808	.420	.513	.068	.045
	PEoU	-.047	.102	-.045	-.462	.645	.586	-.039	-.026
	PB	.506	.074	.553	6.870	.000	.708	.503	.382
	PS	.270	.068	.300	4.001	.000	.575	.321	.222

a. Dependent Variable: BI for BIID

The coefficients in Table 39 showed that despite the representation in the ANOVA Table 38 that PU, PEoU, PB, and PS might influence, community members' and leaders' BI to allow BIID in Lagos, there are two major predictors with statistical significance. PB is presented in the table as the highest predictor of BI to allow BIID (t = 6.870, $p < .000$, β =.506, beta = 553) than PS (t = 4.001, $p < .000$, β =.270, beta = 300). Note also that the assumption of Multicollinearity already tested in Table 15 using the calculated Tolerance and the VIF statistics indicated that the assumption was met.

Perceived Usefulness

The final model confirmed that PU might influence BI to allow BIID, but it is not statistically significant (t = .808, p < .420, β =.065). The details in Table 39, indicate that PU has a weak positive slope of .065 (p > .05), suggesting that for every degree of

increase in PU, there is a marginal increase of .065 in the score of BI to allow BIID. Notice also that the squared semi-partial correlation coefficient (sr2) was 0.68. It indicates that 7% of the variance in the BI to allow BIID is based on PU controlling for the score of PEoU, PB, and PS. The analysis also indicates that the low beta value shows that the weak positive relationship between PU and BI to allow BIID was not significant at p-value .420, greater than the 0.05 alpha level. Therefore, I did not reject the null hypothesis that there is no meaningful relationship between PU and BI to allow BIID. The result contradicts Davis' (1989) finding that PU predicts technology adoption.

Perceived Ease of Use

The final model confirmed that PEoU might influence BI to allow BIID, but it is also not statistically significant ($t = -.462$, $p < .645$, $\beta = -.047$). The details in Table 39, indicate that PEoU has a weak negative slope of -.047 ($p > .05$), meaning that for every degree of increase in PEoU, there is a decrease of -.047 in the score of BI to allow BIID. Notice that the squared semi-partial correlation coefficient (sr2) was -.039 indicating that 4% of the variance in the BI to allow BIID is based on PEoU controlling for the score of PU, PB, and PS. The analysis demonstrates that the negative beta indicates a negative, nonsignificant relationship between PEoU and BI to allow BIID at p-value .645, greater than the 0.05 alpha level. I did not reject the null hypothesis that there is no meaningful relationship between PEoU and BI to allow BIID. The finding also contradicts Davis' (1989) second TAM construct that PEoU predicts technology adoption.

Perceived Benefit

The final model confirmed that PB might influence BI to allow BIID. PB was statistically significant (t = 6.870, p < .000, β =.506). The details in Table 39, indicate that PB has a strong positive slope of .506 (p < .05), signifying that for every degree of increase in PB, there is a corresponding increase of .506 in the score of BI to allow BIID. The squared semi-partial correlation coefficient (sr2) was .503. It indicates that 50% of the variance in the BI to allow BIID is based on PB controlling for the score of PU, PEoU, and PS. The result signifies that the relationship between PB and BI to allow BIID was statistically significant at p-value .000 which is greater than the 0.05 alpha level. Therefore, I reject the null hypothesis that there is no significant relationship between PB and BI to allow BIID. The result aligned with Obinkyereh's (2017) finding that PB predicts technology adoption.

Perceived Security

The final model confirmed that PS might influence BI to allow BIID. PS was statistically significant (t = 4.001, p < .000, β =.270). The details in Table 39, indicate that PB has a moderate positive slope of .270 (p < .05), suggesting that for every point increase in PS, there is an increase of .0270 in BI to allow BIID. The squared semi-partial correlation coefficient (sr2) was .321. It implies that 32% of the variance in the BI to allow BIID is based on PS controlling for the score of PU, PEoU, and PB. The positive beta shows a positive significant relationship between PS and BI to allow BIID at p-value .000, less than the 0.05 alpha level. I did reject the null hypothesis that there is no

significant relationship between PS and BI to allow BIID. The analysis aligns with Nassif's (2019) finding that PS could predict technology adoption.

Summary

The purpose of this quantitative correlational study is to examine the relationship between PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos. I conducted a survey using a pre-existing validated survey instrument used by Obinkyereh (2017). The questionnaire was designed and distributed using survey monkey. The questionnaire returned 166 participants interested in the survey, but only 144 responses were valid for analysis. The demographic study in Tables 6 – 11 presents details of male, female, age group, education qualification, residential information, and leadership/membership status in the community. The data also revealed that 100% of the participants use fixed wireless or wire internet, voice, video, or data services.

The reliability statistics showed that all the 17 variable items used in the study correlate with the constructs. The Cronbach's Alpha for all the 17 variable items was 0.895 suggesting a strong reliability effect, as Asimeng et al. (2020) observed. I tested multiple regression assumptions (homoscedasticity, normality, linearity, multicollinearity, and independent observations). The objective was to forestall possible Type I or Type II errors, including over or under-estimations of significance. I checked to confirm that the data did not violate the assumptions to rule out biases, reliability, and validity issues. I tested the effect of each independent variable on the dependent variable using the bivariate analysis in a simple regression model. The Pearson correlation

analyses indicate a strong positive association between the complexity thinking factors PU, PEoU, PB, PS) and the broadband Internet penetration factor (BI to allow BIID).

I further conducted standard multiple regression analyses to test the controlling effect of PU, PEoU, PB, and PS on community members' and leaders' BI to allow BIID. The final model was statistically significant with F (7, 136) = 6.857, $p < .001$, and adjusted R2 = .223, indicating that these variables can explain 22.3% of the variance in the data. In chapter 3, I will use ANOVA to compare the mean of the community leader from that of the member to understand the variance with the mean of the dependent variable. The model indicated that the leader explained 1% of the variation in the BI score differently from the member who explained 0.3% in the BI score. The combination of leader and member explained 0.2% of the variation in the BI score. So, the leader explained the highest percent of the variability in the BI score.

I concluded with multiple linear regression analysis to further investigate the effect of each independent variable (PU, PEoU, PB, and PS) on the dependent variable (BI to allow BIID). The final model predicted BI for BIID F (4, 139) = 46.147, p = .000 with an adjusted $R^2 = 0.558$, indicating that these variables can explain 56% of the variance in the data.

However, two predictors (PU and PEoU) showed a nonsignificant relationship with BI to allow BIID, while PB and PS indicate a statistically significant relationship. Two predictors in this study, PU and PEoU could not predict community members and leaders' BI for BIID, controlling for some confounders. I, therefore, reject the null hypothesis stating that there is no statistically significant relationship between PU, PEoU,

PB, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos. In Chapter 5, I presented the discussions, conclusions, and recommendations. The interpretations of the analyses done in chapter 4 made an exciting aspect of chapter 5 and give more meaning to the overall study.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this quantitative correlational study was to examine the relationship between PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos. Ogunfuwa (2017) and Elebeke (2019) postulated that enhanced broadband Internet penetration translates to improved economic growth, less poverty, and social vices reduction. The study could help the policymakers identify the factors that may improve broadband Internet penetration. Past scholarly exploration on broadband penetration in Nigeria showed that there is a scarcity of academic research on how PU, PEoU, PB, and PS relate to the BI to allow BIID in the local community in Lagos.

The overall result of this study indicated that the variables PU, PEoU, PB, and PS could predict community members' and leaders' BI to allow BIID controlling for confounding variables. I therefore rejected the null hypothesis stating that there is no statistically significant relationship between PU, PEoU, PB, and PS and community members and leaders' BI to allow BIID at the local community level in Lagos. I applied the multiple regression statistical analysis to the data I collected from the three selected communities in Lagos, using SurveyMonkey as a collection tool. The model framework predicts community members and leaders' BI to allow BIID at the local community level in Lagos. Precisely, the model established that the impact of PB and PS was statistically significant, but PB was the most significant predictor for BI to allow BIID. A detailed presentation of the interpretation criteria follows.

Interpretation of Findings

Researchers and industry scholars attributed the low internet penetration rate in Lagos to the TFs. The authors named policy instability, foreign exchange fluctuations, absence of infrastructure, multiple taxations, inadequate budgetary provisions, and agency regulation as some of the factors (Ogunfuwa, 2017; Teniola, 2017; Aworinde, 2019; Akwaja, 2019; Agbata, 2019). The past efforts from the relevant government agencies and industry regulators seemed to yield a minimal result as the overall country's internet broadband penetration rate is low at 33%. The quest to unravel the cause of the persistent low broadband rate heightens as there has been no study relating the complexity thinking factors (PU, PEoU, PB, and PS) to the allow broadband penetration rate (BI to allow BIID). Aron (2020) and Meadows (2008) agreed that the complexity thinking lens enables viewing problems from a systems perspective. Aron and Meadows' argument also aligned with the TAM by Davis (1989) and the GST by Von Bertalanffy (1972). Thomas's (2020) and Kamara's (2020) thoughts encouraged combining the two views to assess the relationship between the complexity thinking factors and community members and leaders' BI to allow BIID. Using TAM and GST as the theoretical frameworks for this study unlocked the different potential trajectories for the study.

Theoretical Discussion on the Findings

I used the TAM theory founded on the works of Davis (1989), a veteran U.S. technology professor, writer, and publisher. In Chapter 1, I stated that Davis postulated that technology users have options to use or not to use technology. The author categorized these criteria as PU and PEoU. PU is the extent to which a person believes

that a particular system or technology would enhance job performance. At the same time, PEoU explains that using a system or technology should be free of effort (Davis, 1989). Several authors and researchers had adopted Davis' TAM theory because of its expanded view and ease of understanding (Ishola, 2017; Obinkyereh, 2017; Rafique et al., 2020; Schmidthuber et al., 2020; Venkatesh & Davis, 2000; Wang, Wang et al., 2020). The TAM model became famous to the extent that other scholars found the need to include PB and PS as additional constructs to the initial variables (Obinkyereh, 2017; Rafique et al., 2020). This study examined the relationship between four TAM constructs (PU, PEoU, PB, and PS) and community members and leaders' BI to allow BIID.

I explicitly tested the reliability of the TAM constructs for this study despite past validity confirmation (Obinkyereh, 2017). I performed a reliability analysis for all the study items, including the four TAM constructs used in this study. I found that the questions positively correlated with the constructs. The Cronbach's alpha value was 0.823, suggesting a strong reliability effect. A Cronbach alpha value of .7-.8 is an acceptable estimate to offer data reliability (Asimeng et al., 2020; Hu & Plonsky, 2021). The result of the test and confirmation of the validity of the data also means that PU, PEoU, PB, PS are possibly good predictors of community members and leaders' BI to allow BIID at the local community level in Lagos. The data validity and reliability, combined with the other test criteria used in this study, supported the theoretical argument by Davis et al. (1989), Obinkyereh (2017), Ishola (2017), and Nassif (2019) that the TAM model measures BI to allow BIID.

I used the GST to support the TAM model in providing a holistic view to explain the relationship between TAM constructs and broadband Internet penetration in the local community in Lagos. I stated in Chapter 1 that the GST was postulated by Von Bertalanffy (1972). The American biologist's interest was in an open system that produces a complex interaction. The GST provides that a system is a set of interrelated elements standing about the environment (McMahon & Patton, 2018). Von Bertalanffy equated an organization to an open system that requires more than the different dimensions of interactions. Single parts and processes cannot provide a complete picture of a vital phenomenon. The analyses in Chapter 4 reaffirmed that the parts are equally important as the whole, and the conscious coordination of PU, PEoU, PB, and PS predict BI to allow BIID. The concept of GST reveals the relationship between the NTFs (PU, PEoU, PB, PS) and broadband Internet penetration at the local community level in Lagos.

The data from the three selected communities in Lagos and the multiple regression statistical analysis application revealed that the model could predict BI to allow BIID. Indeed, the framework confirmed PB and PS to be statistically significant with BI to allow BIID. The PB score was the most significant predictor of community members' and leaders' BI to allow BIID. However, the other predictors (PU and PEoU) were not significant predictors of BI to allow BIID. The result runs contrary to the original TAM model that PU and PEoU are substantial predictors of technology adoption but aligned with Ishola's (2017), Nassif (2019), and Obinkyereh's (2017) findings that PB and PS were significant predictors of cloud computing technology.

The findings in this research provide a unique perspective on the low broadband penetration rate in Lagos. They also supported the addition of the construct of PB to the TAM model. Policymakers and leaders could consider adopting a different approach aside from the traditional approach that has not produced the desired result. This is so because there has been no research to investigate the relationship between the complexity thinking factors (PU, PEoU, PB, PS) and broadband Internet factors of BI to allow BIID in Lagos. This study closed the gap, and the finding was that PB is the most significant predictor of community members and leaders' BI to allow BIID at the local community level in Lagos. People naturally resist any form of developmental effort if there is a perception that the project would not be beneficial (Cobbinah et al., 2020; Osho & Adishi, 2019). Only leaders who use complex thinking could embark on forensic investigation to unravel the challenges of low broadband Internet and proffer the right solution.

Perceived Usefulness

The analysis showed an insignificant relationship between PU and community members, and leaders' BI to allow BIID at the local community in Lagos. The result aligned with the findings of Nassif (2019) that PU was not a predictor for CCS in Afghanistan but contrary to that of and Davis (1989) and Ishola (2017). Davis (1989) opined that PU was a strong predictor for people to adopt technology services. Similarly, Ishola (2017) observed that PU positively correlates and significantly relates to the quality of Internet connections for technology managers in Nigeria and consequently influences the decision to adopt technology services by SMEs in Nigeria. Obinkyereh

(2017) also agreed that PU significantly determines the adoption of cloud computing services by information technology professionals in Ghana. The scholar concluded that the technology professionals in Ghana found cloud computing as a tool for performance improvement and increased productivity among technology professionals in Ghana. I found PU to be an insignificant determinant of community members and leaders BI to allow BIID in this study. It explained for only 7% of the variance of BI to allow BIID at the local community in Lagos. The p-value = 0.420 much higher than the test criteria ($p <$ .05). The result indicates that any form of association between PU and community members and leaders' BI to allow BIID at the local community could be a probable outcome. The perception of the usefulness of broadband Internet in the local community does not determine community members' and leaders' BI to allow the deployment of broadband Internet infrastructure at the local community level.

Perceived Ease of Use

The finding indicated a nonsignificant relationship between PEoU and community members and leaders' BI to allow BIID at the local community in Lagos was insignificant. The result aligned with Gómez-Ramirez et al.'s (2019) finding that PEoU has an insignificant impact on the M-learning intention of Instituto Tecnológico Metropolitano (ITM) students. Shanahan (2020) also conducted a related study on extraversion and technology adoption propensity and found that PEoU has no significant relationship with user intention to participate in the lateral exchange markets (LEM). Both findings supported Obinkyereh's (2017) stance that PEoU does not significantly predict technology adoption. Conversely, Nassif (2019) and Ishola (2017) demonstrated

that PEoU was a strong predictor of BI to adopt technology at different levels. The findings further reaffirmed Davis' (1989) postulation that PEoU predicts the users' BI adoption of new technology innovations. PEoU is an insignificant predictor of community members and leaders BI to allow BIID in this study. It explained for only 4% of the variability of BI to allow BIID at the local community level in Lagos. The p-value = 0.645 higher than the test criteria ($p < .05$). The perception of the ease of use of broadband Internet in the local community does not determine community members' and leaders' BI to allow the deployment of broadband Internet infrastructure.

Perceived Benefit

The analysis results demonstrated the existence of a significant relationship between PB and community members and leaders' BI to allow BIID at the local community in Lagos. The outcome supported Obinkyereh's (2017) finding that there is a significant positive relation between PB and cloud computing adoption decisions by information technology professionals in Ghana. The details of the analysis in this study indicated that PB accounts for 50% of the variation in BI to allow BIID in the local community in Lagos. The broad implication of the result is that community members and leaders are unanimous that the community stands to benefit immensely by allowing broadband Internet operators to deploy technological infrastructure. The community members and leaders could have also agreed that broadband Internet deployment translates to a faster internet speed and efficiency of both group and individual's digital exploration. The perceived benefit was also a significant factor that predicts the adoption of technology in different spheres. Sengkhyavong (2019) established that the PB of cloud

computing is an essential trigger for the IT managers in SMEs ' decision to adopt cloud computing in the organizations. Chen (2018) further asserts that the PB construct is vital because it underplayed other constructs like PS and perceived privacy. The scholar noted that "consumers are attracted to benefit, they pay less attention to cost, and vice versa" (Chen, 2018, p. 86). Therefore, community members' and leaders' perceived benefit sometimes explains the tolerance for PS.

Perceived Security

The analysis indicated that there was a significant relationship between PS and community members and leaders' BI to allow BIID at the local community in Lagos. The finding confirms prior research by Nassif (2019) but contradicts Obinkyereh (2017), and Ishola that there is a significant relationship between PS and cloud computing technology adoption across the different geographies of research. Previous studies found PS to have a negative influence on the adoption of various technological innovations. Chen (2018) attributed such a negative relationship to users' disposition who sometimes become risk-averse to the extent that they ignore the security risks once the benefits are high. Sengkhyavong's (2019) hypothesis testing also revealed that PS was not a significant predictor of technology adoption by IT managers in the SMEs, $\beta = .124$, $t\ (84) = 1.569$, $p > .05$. The result from this study seems to disagree with the scholars who found a negative association with the PS construct. I established a significant relationship between PS and community members and leaders' BI to allow BIID. PS explained for only 32% of the variance in the score of BI to allow BIID at the local community in Lagos. The p-value = .000 less than the test criteria ($p < .05$). Despite the statistical significance of PS to

predict BI to allow BIID, the PB scores indicate that it is the stronger predictor of BI to allow BIID. The perception of the inherent benefits that the communities stand to gain might control the perception of security for broadband Internet services.

Discussion

The research findings indicate that other NTFs affect broadband Internet development in Nigeria. Scholars and industry actors had named broadband infrastructure, agency integration, multiple taxations, tensed political environment, budget, and regulation as conventional issues affecting broadband penetration. On the contrary, the policymakers have not considered complexity thinking factors as possible militating factors against broadband Internet. In this study, I identified a gap in which the complexity thinking factors of perceived benefit (PB) have a statistically significant relationship with community members and leaders' BI to allow BIID. The result might convince industry stakeholders, who could hitherto ignore the intangible complexity thinking factors.

The TFs are predominantly physical measures and had been helpful to some extent in other environments. However, the underlining issues of the perceived ignorance of complexity thinking factors (PU, PEoU, PB, and PS) made the physical measures counter-intuitive to produce the desired result. Policymakers and the telecom industry stakeholders should adopt a different approach by creating more awareness about the benefits of broadband Internet to reduce resistance to the deployment of broadband Internet Infrastructure at the local community level. Adepetun and Areo (2019) argued that people would protect broadband Infrastructure when they are perceived to be part-

owners of the project. Chen (2018) also supported the argument that people can go any length to support projects with a higher perception of benefit. The study result indicates that PU and PEoU were not statistically significant predictors of BI to allow BIID, and the reason might be because of the high score of PB and PS. The gap I conceptualized as complexity thinking factors using the TAM model is complex partly because the factors seem negligible but have multifaceted implications on broadband Internet and other business developments in Nigeria.

Most telecommunication operators in Nigeria suffer from one form of disruption or the other. It ranges from the state and local government posting a high tariff on the right-of-way to discourage fiber vendors from laying the infrastructure. Or vandalization of telecoms infrastructure for short-term gain and outright stoppage of broadband infrastructure installations. BI to allow BIID manifests in different forms. It takes leaders with complex mindsets to comprehend the need for complex interactions among the other societal agents to solve the problem. Smooth, fast, and robust access to the Internet is the desire of many people in Nigeria today (Agbata, 2019). People want to have access to uninterrupted broadband connectivity to feel the full impact of a digitized world. Broadband Internet connectivity is the 21st-century information age of what electricity was to the industrial era (Federal Ministry of Communications Technology, 2013-2018). Government and policymakers should rise and support every effort that will enhance broadband internet deployment and promote digitization. Nigeria now has a ministry of communication and digital economy to focus on developing the different aspects of digitization (Suleiman, 2020). The Federal Minister of communication and the digital

economy has started a new revolution among the youth in Nigeria. The Ministry intends to drive technological skill acquisition among youths by establishing technology training centers across Nigeria. Suleiman (2020) noted that the positive social change effect would be massive employment generation in Nigeria's already saturated labor market.

There has been much emphasis on paper qualification in Nigeria and less on technological skill acquisition (Suleiman, 2020). The pursue of the new broadband penetration target is beginning to alter the narratives. Emphasis is now shifting to technical skills acquisition to enable the country to achieve economic digitization. Tugbiyele (2019) argued that the fastest means of achieving the goal is to adopt 4G or higher technology and the right mix of broadband Internet penetration. Nigerian schools are now considering the inclusion of technical skills into the curriculum to produce reputational graduates with the practical skills to operate in the digital world (Suleiman, 2020). Broadband Internet is the platform for digitization (Švigelj et al., 2019). Most of the digitization benefits I highlighted in this discussion session might remain a dream if policymakers continue to chase the TFs rather than adopting a complexity mindset. Complexity and systems thinking enables leaders to understand the complex interaction and see the different parts making up the whole (Crowder et al., 2020; Meadows, 2008). I focused this study on the complexity thinking factors using the TAM models of PU, PEoU, PB, and PS. It is not my intention to consider the effect of all the TFs as covariates on the independent variable, BI, to allow BIID (broadband Internet penetration factors). I want to recommend future researchers explore the different aspects of traditional elements and covariates to understand their impact on broadband Internet penetration.

The study results post a new challenge on policymakers in the Nigerian telecoms sector to embark on new research and analysis to understand how other nonconventional factors influence broadband Internet penetration rates in the different states in Nigeria

Limitations of the Study

I encountered several limitations in this study. The first limitation was that I could not distribute the questionnaire directly to the three selected communities' platforms. I used three representatives that are already on the various communities' platforms. Community members and leaders were comfortable interacting with the representatives who do not have all the answers to the questions asked on the platforms. There were several iterative processes between the members on the platforms, the representatives, and me. Most of the questions were on some constructs and meaning of technical jargon that I had explained in chapter 1. I envisioned from the beginning that I might encounter resistance from some of the community leaders proposed for the survey, but the engagement turned out positive and manageable. The selected representatives were able to share the survey link, and the completion rate was encouraging. However, I do not have much insight into how much of their personal biases influence the participants' responses to the questions.

The second limitation I observed was that I narrowed the complexity thinking factors to just four TAM variables. However, as I proceed with the study, I found that community of residence, age, gender, educational qualification, and status as confounding variables could influence community members' and leader BI. For instance, Ogunfuwa (2017) observed that some community leaders in Nigeria tend to conserve

data. I could have ignored a crucial aspect of this study without adjusting for confounders. There are also possible other factors that might have influenced BI to allow BIID but not considered in this study.

The third limitation was that I focused this study on the complex thinking factors or nontraditional PU, PEoU, PB, and PS factors. I did not address specific broadband Internet service-related constructs such as voice, data-streaming videos, upload and download speed, application usage, and more. Restructuring the questions to investigate these broadband Internet packages might lead to an entirely different result. The participants were community members and leaders who have access to the Internet from three purposively selected communities in Lagos. The result might be different if I drew community members and leaders from other communities outside Lagos State. It might be challenging to study the impact of the same complexity thinking factors on broadband Internet in a different cultural and environmental setting and achieve the same result. Thus, the generalization of this study beyond the cultural environment might produce a different result.

The fourth limitation is that I used a quantitative correlational study design to examine the relationship between PU, PEoU, PB, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos. The result could be different with a different research design such as qualitative or mixed-methods inquiry. The use of multiple regression analysis to test the strength of the relationship between complexity thinking/ NTFs and broadband penetration factor might exclude the analysis of some other vital variables. There may be a need to expand the study beyond

understanding the strength of the relationship between the factors in a different environment beyond Lagos and Nigeria in future research.

Recommendations

The last sentence of the limitation session of the study indicates that I researched Lagos, Nigeria, with specific factors in focus. Broadband internet is a critical phenomenon and a driver to economic growth in Nigeria (Imasheva & Kramin, 2020; Ogbo et al., 2018). Complexity thinking factors are the researcher's constructs for the NTFs affecting broadband Internet penetration in Lagos, Nigeria. The factors might be the same across the board concerning the other critical sectors of the Nigerian economy. Government and policymakers should look beyond what is known or conventional factors in handling the multifaceted problems confronting the growth of the Nigerian economy. Nigeria is the most populous country in Africa and the most populous black nation (World Population Review, 2019). As the biggest economy in Africa (National Bureau of Statistics, 2020a), Nigeria has over 22 untapped mineral resources but decided to focus only on crude oil as the mainstay of the economy.

Complexity thinking lenses would expand the horizon of the leadership to see the advantages of exploring the other resources. For instance, the creation of sensitization programs could increase citizens' perception of the benefits of government programs. Since this study established that PB has a statistically significant relationship with community members and leaders' BI, an increased in the PB among citizens might translate to positive behavior. In addition to the TAM model, the GST principles could help leaders understand the dynamic nature of the different elements in a system using

the lenses of critical thinking skills (Meadows, 2008). The Nigerian economic leaders and policy drivers should look beyond the traditional revenue sources to the other untapped territories of the endowed natural resources to transform the country.

Future researchers should consider complexity thinking factors that apply to other geographical locations. Bolman and Deal (2013) were emphatic in their conclusion that all organizations are open systems having exchanges with the immediate environment. The authors argued that organizational responses to signals from the environments must vary with the peculiarities of the domain. The scholars advocated that leaders must have a contingency plan to respond to every unique challenge using scenario planning. The complexity thinking factors of PU, PEoU, PB, and PS might not have the same effect in other environments. Future researchers should consider what works with the climate of research by approaching complexity factors from different trajectories directly bearing on the environment. The outcome might not be the same but could align with the conceptualizations and the operationalization of the construct that the researcher crafted for the new research setting.

I explored primary data in this quantitative correctional study. Most times, the primary data collection approach produces smaller sample sizes than secondary data, but it is within the researcher's direct control (Babbie, 2017). Future researchers should consider larger sample sizes and an amendment to the research design. Suppose the interest is to continue with the quantitative inquiry. In that case, a large sample size could eliminate the possibility of third-party errors of the second dataset, increase external validity, and the issue of generalization. More so, future researchers should try out other

methodological approaches. A qualitative approach would increase the depth of the epistemological assumption (Babbie, 2017; Bastianin, 2020). For instance, the researcher could have an in-depth understanding of other reasons for community members and leaders' BI to allow BIID beyond the complexity thinking factors of PU, PEoU, PB, and PS. In this study, I established the relationship between some complexity thinking factors and BI to allow BIID. A qualitative investigation might reveal more aspects and expose detailed behavioral attributes. Future researchers could combine quantitative and qualitative methods to achieve depth, breadth, rigor, and triangulation (Onghena, Maes & Heyvaert, 2018). Interviewing the leaders of some of the telecommunication companies in Lagos to understand their perspective about the level of BI to allow BIID from the communities where they operate could give the study a new impetus to achieving the desired validity.

Furthermore, future researchers with similar methodological interests should consider using a bivariate regression to test the relationship between the individual independent variables, covariates, and the dependent variable. Bivariate regression makes it possible for researchers to examine how each independent variable predicts the dependent variable using different regression models and analysis of variance (ANOVA) (Frankfort-Nachmias & Leon-Guerrero, 2018). Bivariate regression analysis provides a mental and graphical understanding of the strength of the relationship or association between complexity thinking and broadband internet penetration. I further categorized complexity thinking factors as PU, PEoU, PB, and PS. The BIID factor is community members and leaders' BI to allow BIID. Using multiple regression for this study further

breaks down the effect of controlling the individual independent variables and the relationship on BI to allow BIID as the dependent variable. The following section will discuss the theoretical, practical, and social change implications of the study results and the limitations

Implications

The result of this study has a remarkable implication on positive social change by examining the relationship between complexity thinking and broadband Internet penetration. The findings could help policymakers and heads of government at various levels to understand the other approaches that may improve broadband Internet penetration for economic improvement. The results from a World Bank report indicates that for every 10% increase in broadband services, there is a corresponding 1.38% improvement in the -GDP of low income and middle-income countries (Jayakar, 2018; Kelly & Rossotto, 2012; Urama & Ogbu, 2018). Kelly and Rossotto (2012) argued that broadband had made the world economy steady growth and development. NCC's industry report reveals that broadband contribution to the Nigerian GDP stood at 8.6% in 2018 but desired to improve the penetration rate from the present 33% to boost further the economy (Nigerian Telecommunications Commission, 2018).

In this study, I identified PB to have a significant relationship with community members and leaders' BI to allow BIID at the local community level. The finding suggests other nontraditional ways (complexity thinking factors) to improve broadband Internet development in Lagos, Nigeria. The positive social change effect of this research is that improving the rate of broadband Internet could lead to the social transformation of

the sectors of education, economy, agriculture, transportation, health, manufacturing, employment, and the overall wellbeing of the society (Abang, 2016; Kelly & Rossotto, 2012; Nwankwo, 2018; ITU, 2017, NCC, 2018). The study unraveled that an improvement in the broadband penetration rate in Lagos might lead to an effective form of a technological revolution. It could attract foreign direct investment, economic growth, poverty reduction, and reduced social vices leading to a gross positive social change effect on the society.

Researchers have explored the link that the TAM and GST theories have on several other disciplines. But none of the studies considered the relationship between complexity thinking and broadband Internet penetration from the perspective of using the TAM constructs and the GST. The study has a validation implication on the TAM model by Davis (1989) Von Bertalanffy's (1972) GST. While it contradicted Davis' (1989) initial TAM models of PU and PEoU refuting prediction of intention to adopt the technology. The result supported the extended TAM (ETAM) model (Venkatesh & Davis, 2000) that PB and PS are essential predictors of BI to allow BIID at the local community level in Lagos. The study validated the GST on the interaction or the wellness of different parts that determine the health of the whole in the context of an open system that produces complex interactions. The positive social change effect is that the study might catalyze change for industry leaders' and policymakers' level of understanding of the reason for the low broadband Internet penetration in Lagos, Nigeria. The former thinking was that broadband underdevelopment stems from some known TFs. The same thought process might have affected broadband development in Lagos, Nigeria, for

decades. The new normal is that the findings from this research have validated Von Bertalanffy's (1972) and Venkatesh and Davis' (2000) stands. It challenges future researchers to consider alternative methodological approaches to unraveling complex and life-threatening problems. The implication of the answers from this study challenges conventional knowledge in leadership and decision-making and provides broad-spectrum opportunities for further research.

The study has varying crucial implications for leadership practice across organizations, public and private. For instance, the research outcome exposes the vital role of community integration and education in developmental strategic decision-making. The result of the study also revealed the possible reasons for the perennial problem of underdevelopment in other sectors of the Nigerian economy, aside from the telecommunication sector. The review of the current issues confronting broadband Internet penetration from a different perspective of the PB through research and not just deploying infrastructure can contribute to the leadership and organizational change. The evidence that has emerged from the study could have further endorsed Venkatesh and Davis' (2000) and Von Bertalanffy's GST on how the interaction or the wellness of the different parts determine the fitness of the whole in the context of an open system that produces complex interactions. Leadership and management practitioners now have a new application stream for the TAM and GST theories in solving other societal problems.

Conclusions

The low broadband Internet penetration in Lagos, Nigeria, affects human and business development at all levels of society (Communication Week, 2019; Ogunfuwa, 2017; Onwuaso, 2019; Townsend et al., 2015). The limited access to broadband Internet has crippled lots of start-ups, increased unemployment, and poverty rates, and has led to the growth in the crime rate and other social vices (Communication Week, 2019; Ogunfuwa, 2017; Onwuaso, 2019). The problems resulting from the underdevelopment of broadband Internet in Lagos, Nigeria, have generated concerns and necessitated several brainstorming sessions among industry stakeholders and policymakers. Researchers engaged in different studies to unravel the cause of low broadband Internet despite the enormous foreign and local investments in the communication sector in Nigeria (Ogunfuwa, 2017; Teniola, 2017). None of the researchers have studied the relationship between complexity thinking TAM constructs of PU, PEoU, PB, PS, and the broadband Internet penetration factor of community members and leaders BI to allow BIID. In this quantitative correlational study, I examined the relationship between PU, PB, PEoU, PS, and community members and leaders' BI to allow BIID at the local community level in Lagos.

The overall study model revealed a statistically significant relationship between complexity thinking conceptualized as PU, PEoU, PB, PS, and BI to allow BIID at the local community level. The findings aligned with the TAM model by Davis (1989) and Venkatesh and Davis' (2000) that the TAM and ETAM models can predict technology adoption. It also aligned with Von Bertalanffy's (1972) GST postulations that the

interaction or the wellness of the different parts determine the health of the whole in the context of an open system that produces complex interactions. I performed further investigations to understand the extent of the relationship and the contribution of each variable to the model. The analysis revealed that PB and PS have a statistically significant association with Community members and leaders' BI to allow BIID at the local community in Lagos. The study also established that PB is the most significant predictor of community members' and leaders' BI to allow BIID. The outcome supported Obinkyereh's (2017) finding that PB was a good predictor of cloud computing adoption by IT professionals in Ghana and Nassif's (2019) finding that PS could predict technology adoption. However, the detailed analysis found PU and PEoU to have a nonstatistically significant relationship with BI to allow BIID. The result disputed Davis' (1989) claim that PU and PEoU could predict technology innovation adoption. It, however, aligns with Venkatesh and Davis' (2000) that the ETAM models can predict technology adoption The study also agreed with Chen's (2018) postulation that people are willing to give up other desires no matter the risk involved if there is a strong perception of benefit.

It, therefore, suggests that industry stakeholders and policymakers should not ignore the community when crafting broadband Internet development policies. Despite some of the limitations in design, the study established a considerable knowledge gap between government policies and the community. Perhaps, intensive sensitization on the benefits of broadband Internet across geographical regions could improve broadband Internet acceptance across local communities and, by extension, the penetration rate.

Policymakers and scholars could use this study as a platform for future development to expand the spheres of inquiry and contribute to knowledge. Researchers should examine the effect of other variables and apply different methodologies to understand the problems from unique trajectories. Such efforts might advance the course of identifying uncharted territories to contribute to positive social change, community transformation, and a better world for all.

References

Abang, M. (2016). Worldwide of fraud. *IT and Telecom Digest. Shaping the Future*, *174*, 5-46. https://ittelecomdigest.com/?s=%20Worldwide%20of%20fraud

Abdulsalam, K., & Babatunde, O. (2019). Electrical energy demand forecasting model using artificial neural network: A case study of Lagos State Nigeria. *International Journal of Data and Network Science*, *3*(4), 305-322. https://doi.org/10.5267/j.ijdns.2019.5.002

Adeniyi, O. F., Fagbenro, G. T., & Olatona, F. A. (2019). Overweight and obesity among school-aged children and maternal preventive practices against childhood obesity in select local government areas of Lagos, Southwest, Nigeria. *International Journal of MCH and AIDS*, *8*(1), 70. https://doi.org/10.21106/ijma.273

Adepetun, A. (2019, March 20). States should support fiber expansion. *The Guardian*. https://guardian.ng/technology/states-should-support-fibre-expansion/

Adepetun, A., & Areo, O. (2019, July 10). Subscribers' pains to increase as Nigeria's Internet speed slows. *The Guardian*. https://guardian.ng/technology/c55-technology/subscribers-pains-to-increase-as-nigerias-Internet-speed-slows/

Agbata, F. C. (2019, May 26). Encouraging ICT local content in the Nigerian oil industry. *The Punch*. https://punchng.com/encouraging-ict-local-content-in-nigerias-oil-industry/

Agbionu, U. C., Anyalor, M., & Nwali, A. C. (2018). Employee engagement and performance of lecturers in Nigerian tertiary institutions. *Journal of Education and Entrepreneurship, 5*(2), 69-87. https://doi.org/10.26762/jee.2018.40000015

Agiwal, M., Saxena, N., & Roy, A. (2019). Towards connected living: 5G enabled Internet of things (IoT). *IETE Technical Review*, *36*(2), 190-202. https://doi.org/10.1080/02564602.2018.1444516

Ahmed, A. (2008). *Ontological, epistemological, and methodological assumptions: Qualitative versus quantitative*. Online Submission. http://files.eric.ed.gov/fulltext/ED504903.pdf

Akwaja, C. (2019, May 6). NCC boss to unveil a new broadband plan at the forum. *Leadership Newspaper*. https://leadership.ng/?s=NCC+boss+to+unveil+a+new+broadband+plan+at+the+forum

Alameddine, R., Taleb, R., Al-Habbal, K., & Patel, K. D. (2020). Systems thinking to advance health advocacy training; a perspective from junior family physicians in the Middle East. *Education for Primary Care*, 1-3. https://doi.org/10.1080/14739879.2019.1711201

Aldrich, J. (2008). *Professor A. L. Bowley's theory of the representative method*. http://www.economics.soton.ac.uk/staff/aldrich/aldrich%20on%20bowley.pdf

Amodu, L., Odiboh, O., Usaini, S., Yartey, D., & Ekanem, T. (2019). Data on security implications of the adoption of the Internet of Things by public relations professionals. *Data in Brief*, 27, 104663. https://doi.org/10.1016/j.dib.2019.104663

Anderson, D. L. (2019). *Organization development: The process of leading organizational change*. SAGE Publications.

Aron, D. C. (2020). Drawing upon medicine to teach complex systems to business school students: 2 thinking in systems. In D. C. Aron (Ed.), *Complex systems in medicine* (pp. 189-198). Springer. https://doi.org/10.1007/978-3-030-24593-1_15

Ary, D., Jacobs, L. C., Irvine, C. K. S., & Walker, D. (2018). *Introduction to research in education*. Cengage Learning. https://www.modares.ac.ir/uploads/Agr.Oth.Lib.12.pdf

Asimeng, E., Zhang, S., Esther, A., & Li, M. (2020, December). Examining the Relationship Between Foreigners in China Food Delicacies Using Multiple Linear Regression Analysis (sklean). *In International Conference on Big Data Analytics for Cyber-Physical-Systems* (pp. 1814-1823). Springer.

Aworinde, T. (2019, June 20). ATCON slams NCAAsays it won't rebuild demolished masts. *The Punch*. https://punchng.com/atcon-slams-ncaa-says-it-wont-rebuild-demolished-masts/

Babbie, E. (2017). *Basics of social research* (7th ed.). Cengage Learning.

Badmos, O. S., Rienow, A., Callo-Concha, D., Greve, K., & Jürgens, C. (2019). Simulating slum growth in Lagos: An integration of rule-based and empirical-based model. *Computers, Environment and Urban Systems, 77*, 101369. https://doi.org/10.1016/j.compenvurbsys.2019.101369

Bamiteko, O. D., & Adebiyi, O. O. (2020). Neighborhood security and housing price in Amuwo-Odofin local government area of Lagos State. *Journal of Business and Economic Development, 5*(4), 214. https://doi.org/10.11648/j.jbed.20200504.13

Bansal, P., Smith, W. K., & Vaara, E. (2018). *New ways of seeing through qualitative*

research. Academy of Management Journal, 61(4). https://doi.org/10.5465/amj.2018.4004

Baron, C., & Daniel-Allegro, B. (2019). About adopting a systemic approach to design connected embedded systems: A MOOC promoting systems thinking and systems engineering. *Systems Engineering, 23*(3), 261-280. https://doi.org/10.1002/sys.21513

Bastianin, A. (2020). Robust measures of skewness and kurtosis for macroeconomic and financial time series. *Applied Economics, 52*(7), 637-670. https://doi.org/10.1080/00036846.2019.1640862

Belluomini, E. (2016). *Digitally immigrant social work faculty: Technology self-efficacy and practice outcomes* (Order No. 10250293). Available from Dissertations & Theses @ Walden University; ProQuest Central; ProQuest Dissertations & Theses Global. (1862145385).

Bolden, R., Gulati, A., & Edwards, G. (2020). Mobilizing change in public services: Insights from a systems leadership development intervention. *International Journal of Public Administration, 43*(1), 26-36. https://doi.org/10.1080/01900692.2019.1604748

Bolman, L. G., & Deal, T. E. (2013). *Reframing organizations: Artistry, choice, and leadership* (5th ed.). Jossey-Bass.

Bridges, R. (2019). *Impact of broadband policy on rural providers: An interpretive phenomenological analysis* [Doctoral dissertation, Northcentral University]. https://search.proquest.com/openview/a61b0c5cc53c3471b9ca0c9292485477/1?p

q-origsite=gscholar&cbl=18750&diss=y

Brown, G., Strickland-Munro, J., Kobryn, H., & Moore, S. A. (2017). Mixed methods participatory GIS: An evaluation of the validity of qualitative and quantitative mapping methods. *Applied Geography, 79,* 153-166.

Bullu, S. L. (2020). An overview of Nigeria's legal framework and structural position towards corruption. *National Journal of Criminal Law, 2*(2). http://lawjournals.stmjournals.in/index.php/njcl/article/view/342

Burkholder, G. J., Cox, K. A., & Crawford, L. M. (2016). *The scholar-practitioners guide to research design*. Laureate Publishing.

Calandro, E., Gillwald, A., Lewis, C., Mothobi, O., & Rademan, B. (2018). *Final version*. https://researchictafrica.net/wp/wp-content/uploads/2018/02/2018_Research-ICT-Africa-submission-to-South-Africa-parliament.pdf

Camba, A. L., & Camba, A. C., Jr. (2020). The cointegration relationship and causal link of Internet penetration and broadband subscription on economic growth: Evidence from ASEAN countries. *Journal of Economics and Business, 3(1).* https://doi.org/10.31014/aior.1992.03.01.173

Chanclou, P., Neto, L. A., Simon, G., Saliou, F., Neyret, N., Thily, E., Abgrall, D., & Minodier, D. (2020, March). Choice of optical access innovations to meet today's needs and support the challenges of tomorrow. *In Optical Fiber Communication Conference* (pp. W4E-5). Optical Society of America. https://doi.org/10.1364/OFC.2020.W4E.5

Chatterjee, S., Xiao, X., Elbanna, A., & Saker, S. (2017, January). The information systems artifact: A Conceptualization based on general systems theory. In *Proceedings of the 50th Hawaii International Conference on System Sciences.* https://doi.org/10.24251/HICSS.2017.68

Chen, Y. (2018). *Security risk tolerance in mobile payment: A tradeoff framework* (Order No. 10927995). Available from ProQuest Dissertations & Theses Global. (2128016466).

Chika, O. C., & Prince, E. A. (2020). Comparative assessment of trace and heavy metals in available drinking water from different sources in the Centre of Lagos and off Town (Ikorodu LGA) of Lagos State, Nigeria. *Advanced Journal of Chemistry-Section A, 3*(1), 94-104. https://doi.org/10.33945/sami/ajca.2020.1.9

Çoban, Ö. (2020). Information and communication technologies literacy: Planning of teachers' information and communication technologies training in Turkey. *In Utilizing Technology, Knowledge, and Smart Systems in Educational Administration and Leadership* (pp. 161-183). IGI Global. https://doi.org/10.4018/978-1-7998-1408-5.ch009

Cobbinah, P. B., Okyere, D. K., & Gaisie, E. (2020). Population growth and water supply: The future of Ghanaian cities. *In Megacities and Rapid Urbanization: Breakthroughs in Research and Practice* (pp. 96-117). IGI Global. https://doi.org/10.4018/978-1-5225-9276-1.ch005

Commonwealth. (n.d.). *Nigeria: History. The Commonwealth*. http://thecommonwealth.org/our-member-countries/nigeria/history

Communication Week. (2019, June 10). NCC targets 70 percent broadband penetration by 2024. *Communication Week.* https://nigeriacommunicationsweek.com.ng/ncc-targets-70-per-cent-broadband-penetration-by-2024/

Cook, M. R., Succo, K. F., Gee, K. L., Sommerfeldt, S. D., & Neilsen, T. B. (2019). Bandwidth extension of narrowband-signal intensity calculation using additive, low-level broadband noise. *The Journal of the Acoustical Society of America, 145*(5), 3146-3153. https://doi.org/10.1121/1.5108661

Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage Publications.

Crilly, N. (2019). Methodological diversity and theoretical integration: Research in design fixation as an example of fixation in research design? *Design Studies, 65*, 78-106. https://doi.org/10.1016/j.destud.2019.10.006

Crowder, J. A., Carbone, J., & Friess, S. (2020). Systems-level thinking for artificial intelligent systems. In *Artificial Psychology* (pp. 15-27). Springer. https://doi.org/10.1007/978-3-030-17081-3_2

Crowell, D. M., & Boynton, B. (2020). *Complexity leadership: Nursing's role in health care delivery*. FA Davis. https://books.google.com.ng/books?hl=en&lr=&id=G5jIDwAAQBAJ&oi=fnd&pg=PR3&dq=Complexity+leadership:+Nursing%27s+role+in+health+care+delivery.&ots=2nvimRXiYO&sig=zLaw1wj0BucJYc94bsxq2zW40Tc&redir_esc=y#v=onepage&q=Complexity%20leadership%3A%20Nursing's%20role%20in%20health%20care%20delivery.&f=false

Daftary, A., & Craig, G. (2018). Qualitative methods for identifying domains (roots) of TB Stigma. *TB Stigma*, 38-54. https://www.challengetb.org/publications/tools/ua/TB_Stigma_Measurement_Guidance.pdf#page=39

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319-340. https://doi.org/10.2307/249008

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science, 35*(8), 982-1003. https://doi.org/10.1287/mnsc.35.8.982

Dawadi, B. R., Rawat, D. B., Joshi, S. R., & Baral, D. S. (2020). Affordable broadband with software-defined IPv6 network for developing rural communities. *Applied System Innovation, 3*(1), 4. https://doi.org/10.3390/asi3010004

Dieckmann, U., Hager, G., Magnuszewski, P., & Lees, M. (2020). Human capabilities for systems leadership: Disseminating systems thinking through education and training. *In: Systemic Thinking for Policy Making*, 153-166. https://doi.org/10.1787/2baea395-en

Dosumu, O., Hussain, J., & El-Gohary, H. (2020). An exploratory study of the impact of government policies on the development of small and medium enterprises in developing countries: The case of Nigeria. In Information resources management Association, *Start-ups and SMEs: Concepts, methodologies, tools, and applications* (pp. 1205-1218). IGI Global. https://doi.org/10.4018/978-1-7998-1760-4.ch062

Elebeke, E. (2019, January 18). Last-mile broadband: ITU's lightweight optical cable to the rescue - *Vanguard News Nigeria*. https://www.vanguardngr.com/2019/01/last-mile-broadband-itus-lightweight-optical-cable-to-the-rescue/

Endicott, L. (n.d). *IRB ethics review at Walden* (Online Tutorial). Retrieved July 27, 2016, from https://waldencfe.adobeconnect.com/irb/

Falch, M., & Iaskio, E. L. S. (2019). *National broadband strategies–The case of Brazil.* The 2nd Regional African Conference of the International Telecommunications Society. https://www.researchgate.net/publication/324721110_National_Broadband_strategies-The_case_of_Brazil

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175-191. https://doi.org/10.3758/BF03193146

Federal Communications Commission. (2018). *Broadband deployment report*. https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2018-broadband-deployment-report

Flick, U. (2018). *An introduction to qualitative research*. Sage Publications.

Ford, R. C., Piccolo, R. F., & Ford, L. R. (2017). Strategies for building effective virtual teams: Trust is key. *Business Horizons*, *60*(1), 25-34. https://doi.org/10.1016/j.bushor.2016.08.009

Fortunato, M. W., Bridger, J. C., Alter, T. R., Emmerling, G. M., Ortbal, K. J., Schwartz, M., Sterner lll, G. E., & Shuffstall, W. (2013). Promoting fair local organizing for broadband delivery: Suggestions for community-level action in persistently underserved communities. *Journal of Information Policy, 3*, 158-180. https://doi.org/10.2139/ssrn.2031816

Frankfort-Nachmias, C., & Leon-Guerrero, A. (2018). *Social statistics for a diverse society* (8th ed.). Sage Publications.

FreedomLab (Producer). (2010). *Margaret Wheatley: Leadership and the new science: Command and control only lead to more chaos* [Video file]. http://www.margaretwheatley.com/video/freedomlab.html

Galkina, T., & Atkova, I. (2019). Effectual networks as complex adaptive systems: Exploring dynamic and structural factors of emergence. *Entrepreneurship Theory and Practice*. https://doi.org/10.1177/1042258719879670

Gilissen, M. G., Knippels, M. C. P., Verhoeff, R. P., & van Joolingen, W. R. (2019). Teachers' and educators' perspectives on systems thinking and its implementation in Dutch biology education. *Journal of Biological Education*, 1-12. https://doi.org/10.1080/00219266.2019.1609564

Gómez-Ramirez, I., Valencia-Arias, A., & Duque, L. (2019). Approach to M-learning acceptance among university students: An integrated model of TPB and TAM. *International Review of Research in Open and Distributed Learning, 20*(3) doi:http://dx.doi.org.ezp.waldenulibrary.org/10.19173/irrodl.v20i4.4061

Gorard, S. (2021). Multiple Linear Regression 37. *Research Methods and Methodologies*

in Education, 368.

Gordon, R. A. (2020). *Regression analysis*. SAGE Publications Limited. http://dx.doi.org/10.4135/9781526421036878175

Gray, D. E. (2019). *Doing research in the business world*. Sage Publications.

Greenhalgh, T. (2020). Bridging the 'two cultures' of research and service: Can complexity theory help? Comment on "Experience of health leadership in partnering with university-based researchers in Canada–A call to 're-imagine' research." *International Journal of Health Policy and Management, 9*(2), 87-88. https://doi.org/10.15171/ijhpm.2019.89

Gu, H., Xu, J., & Tan, K. (2019). Research and Exploration of Future Optical Communication Technology. *Insight-Information, 1*(1). https://doi.org/10.18282/ii.v1i1.148

Gyaisey, A. P., Boateng, R., Afful-Dadzie, A., & Owusu, A. (2019). *Individuals' internet security perceptions and behaviors: Polycontextual contrast between Ghana and Nigeria*. https://www.researchgate.net/publication/334491407_Individuals_Internet_Security_Perceptions_and_Behaviors_Polycontextual_Contrast_Between_Ghana_and_Nigeria

Hallo, L., Nguyen, T., Gorod, A., & Tran, P. (2020). Effectiveness of leadership decision-making in complex systems. *Systems, 8*(1), 5. https://doi.org/10.3390/systems8010005

Hanif, M. S., Yunfei, S., & Hanif, M. I. (2018). Growth prospects, market challenges and policy measures: evolution of mobile broadband in Pakistan. *Digital Policy, Regulation, and Governance, 20*(1), 42-61. https://doi.org/10.1108/DPRG-04-2017-0014

Hasan, S. (2019). *Towards Scalable Community Networks* [Doctoral dissertation, University of California, Berkeley]. https://escholarship.org/content/qt1zr87965/qt1zr87965.pdf

Hiben, B. M., Anderson, H. W., Anderson, J. S., & Oberlies, B. D. (2019). *US Patent No. 10,264,587*. Washington, DC: US Patent and Trademark Office.

Hong, A., Nam, C., & Kim, S. (2020). What will be the possible barriers to consumers' adoption of smart home services? *Telecommunications Policy, 44*(2), 101867. https://doi.org/10.1016/j.telpol.2019.101867

Hoogeboom, M. A., & Wilderom, C. P. (2020). A complex adaptive systems approach to real-life team interaction patterns, task context, information sharing, and effectiveness. *Group & Organization Management, 45*(1), 3-42. https://doi.org/10.1177/1059601119854927

Hu, Y., & Plonsky, L. (2021). Statistical assumptions in L2 research: A systematic review. *Second Language Research, 37*(1), 171-184. https://doi.org/10.1177/0267658319877433

Imasheva, I. Y., & Kramin, T. V. (2020). Impact of broadband Internet on the economic growth of the Russian regions. In *Proceedings of the First International Volga*

Region Conference on Economics, Humanities, and Sports (FICEHS 2019; pp. 26-28). Atlantis Press. https://doi.org/10.2991/aebmr.k.200114.006

Ishola, B. A. (2017). *A quantitative investigation of cloud computing adoption in Nigeria: Testing an enhanced technology acceptance model* (Order No. 10262816). Available from ProQuest Dissertations & Theses Global. (1883611713).

International Telecommunications Union. (2017). *The state of broadband 2017: Broadband catalyzing sustainable development* https://www.itu.int/dms_pub/itu-s/opb/pol/S-POL-BROADBAND.18-2017-PDF-E.pdf

Jayakar, K. (2018). Universal broadband: Option, right, or obligation? *Journal of Human Values, 24*(1), 11-24. https://doi.org/10.1177/0971685817733569

Kamal, S. A., Shafiq, M., & Kakria, P. (2020). Investigating acceptance of telemedicine services through an extended technology acceptance model (TAM). *Technology in Society*, 60, 101212. https://doi.org/10.1016/j.techsoc.2019.101212

Kamara, E. (2020). *Leadership strategies for reducing regulatory citations to maintain tax-Exempt Statuses in nonprofit organizations* (Order No. 27541153). Available from ProQuest Dissertations & Theses Global. (2309521955).

Kani, J. I., Terada, J., Hatano, T., Kim, S. Y., Asaka, K., & Yamada, T. (2020). Future optical access network-enabled by modularization and softwarization of access and transmission functions. *Journal of Optical Communications and Networking, 12*(9), D48-D56. https://10.1364/JOCN.391544

Kelter, R. (2020). Analysis of type I and II error rates of Bayesian and frequentist parametric and nonparametric two-sample hypothesis tests under preliminary

assessment of normality. *Computational Statistics*, 1-26. https://doi.org/10.1007/s00180-020-01034-7

Kelly, T., & Rossotto, C. M. (2012). *Broadband strategies handbook.* World Bank Publication. https://doi.org/10.1596/978-0-8213-8945-4

Križanović Čik, V., & Rimac-Drje, S. (2016). Broadband ecosystem elements in techno-economic modeling and analysis of broadband access solutions for rural areas. *Technical Gazette, 23*(1), 279-290. https://doi.org/10.17559/TV-20150508131935

Lagos State Government. (2012). *Abstract of Lagos State statistics. Lagos bureau of statistics ministry of economic planning and Budget, Secretariat, Alausa, Ikeja*. https://nairametrics.com/wp-content/uploads/2013/03/Lagos-State-LGA-Statistics-2012.pdf

Lederman, D., & Zouaidi, M. (2020). Incidence of the digital economy and frictional unemployment: International evidence. *World Bank Policy Research Working Paper* (9170). https://doi.org/10.1596/1813-9450-9170

Linkov, I., & Trump, B. D. (2019). Panarchy: Thinking in Systems and Networks. *In the Science and Practice of Resilience* (pp. 35-44). Springer, Cham.

Liu, Q., & Wang, L. (2021). t-Test and ANOVA for data with ceiling and/or floor effects. *Behavior Research Methods, 53*(1), 264-277. https://doi.org/10.3758/s13428-020-01407-2

Mamédio, D., & Meyer, V. (2020). "Managing project complexity: how to cope with multiple dimensions of complex systems," *International Journal of Managing Projects in Business*. Advance online publication. https://doi.org/10.1108/IJMPB-

06-2019-0147

Marshall, C., & Rossman, G. (2016). *Designing qualitative research* (5th ed.). Sage.

Mclver, R. (2019). *Strategies for using information and communication technologies to improve profitability* [Doctoral study, Walden University]. https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=7633&context=dissertations

McMahon, M., & Patton, W. (2018). Systemic thinking in career development theory: contributions of the systems theory framework, *British Journal of Guidance & Counselling, 46*:2, 229-240. https://doi.org/10.1080/03069885.2018.1428941

McNeish, D. M., & Stapleton, L. M. (2016). The effect of small sample size on two-level model estimates. A review and illustration. *Educational Psychology Review, 28*(2), 295-314. https://doi.org/10.1007/s10648-014-9287-x

Meadows, D. H. (2008). *Thinking in systems: A primer*. Chelsea Green.

Mohammad, B. A., Golmohammadi, E., Nekooeezadeh, M., & Mansouri, A. (2017). The effects of organizational culture on the development of strategic thinking at the organizational level. *International Journal of Organizational Leadership, 6*(2), 261-275.: https://doi.org/10.33844/ijol.2017.60385

Morgan, G. (2006). *Images of organization.* Sage Publications.

Naeem, A., Shafique, S., Wadud, Z., Ahmed, S., Safwan, N., & Najam, Z. (2019). Strategic Planning towards Automation of fiber to the home (FTTH) considering optic access network (OAN) model. *International Journal of Advanced Computer Science and Applications, 10*(9). https://doi.org/10.14569/IJACSA.2019.0100930

Nakamori, Y. (2020). *Creative techniques.* In *Knowledge construction methodology: Fusing systems thinking and knowledge management* (pp. 19-40). Springer. https://doi.org/10.1007/978-981-13-9887-2_5

Nassif, G. T. (2019). *Cloud computing adoption in Afghanistan: A quantitative study based on the technology acceptance model* [Doctoral study, Walden University]. https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=9104&context=dissertations

National Bureau of Statistics. (2020a). *The Nigerian poverty profile, 2019 Report*. https://nigerianstat.gov.ng/elibrary?queries[search]=poverty

National Bureau of Statistics. (2020b). *Nigerian gross domestic product report.* (Q4 2019). https://nigerianstat.gov.ng/elibrary?queries[search]=gdp

National Bureau of Statistics. (2020c). The Nigerian population, 2019 Report.

National Institutes of Health (NIH) Office of Extramural Research. (2008). *Protecting human research participants* [Online training course]. http://phrp.nihtraining.com/users/login.php

National Social Safety Nets Coordinating Office - NASSCO. (2020). Over 9 million Nigerians living in poverty – Report. *Nairamatics.* https://nairametrics.com/2020/02/10/over-9-million-nigerians-living-in-poverty-report/

Ndem, E., Udoh, A., Awofisayo, O., & Bafor, E. (2019). Consumer and Community Pharmacists' Perceptions of Online Pharmacy Services in Uyo Metropolis, Nigeria. *INNOVATIONS in pharmacy*, *10*(3), 18-18.

https://doi.org/10.24926/iip.v10i3.1774

Ndichu, E. T., Ohiri, K., Sekoni, O., Makinde, O., & Schulman, K. (2019). Evaluating the quality of antihypertensive drugs in Lagos State, Nigeria. *PloS one, 14*(2). https://doi.org/10.1371/journal.pone.0211567

Nechkoska, R. P. (2020). Theoretical foundations: Management—information systems—complexity. *In Tactical Management in Complexity* (pp. 65-134). Springer, Cham. https://doi.org/10.1007/978-3-030-22804-0_3

Ng'weno, B. (2020). *The Historical, political, and demographic context of leadership in Africa. In developing global leaders* (pp. 59-87). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-14606-1_4

Nigerian Communications Commission. (2018). *Percentage contribution of the telecoms industry to GDP*. https://www.ncc.gov.ng/stakeholder/statistics-reports/industry-overview#view-graphs-tables-7

Nigerian Communications Commission. (2020). *Internet subscriber data. Active Internet subscriptions by technology* (March 2019–February 2020). https://www.ncc.gov.ng/statistics-reports/industry-overview#view-graphs-tables-5

Nwankwo, W. (2018). Extending affordable, reliable broadband Internet to educational institutions in Edo State. *Computing, 6*(1), 1-11. https://doi.org/10.11648/j.iotcc.20180601.11

Obi, H. O. (2020). Violence against persons (prohibition) act 2015: Advancing legal protections of women against violence in Nigeria. *International Review of Law and Jurisprudence, 2*(1).

https://www.researchgate.net/publication/317490642_Legislating_on_Violence_Against_Women_A_Critical_Analysis_of_Nigeria's_Recent_Violence_Against_Persons_Prohibition_Act_2015

Obinkyereh, W. T. (2017). *Cloud computing adoption in Ghana: A quantitative study based on technology acceptance model (TAM)*. (Order No. 10286333). Available from ProQuest Dissertations & Theses Global. (1914913372).

Odunsi, W. (2020, January 9). NCC in 2019: Report reveals impressive growth statistics, upward trajectory of broadband penetration. *The Daily Post*. https://dailypost.ng/2020/01/09/ncc-in-2019-report-reveals-impressive-growth-statistics-upward-trajectory-of-broadband-penetration/

Ogbo, E., Brown, T., & Sicker, D. (2018). Is broadband speed a barrier to Internet use in rural communities? An assessment of mobile infrastructure and Internet use habits in urban and rural Nigeria. *The 46th Research Conference on Communication, Information, and Internet Policy 2018*. https://doi.org/10.2139/ssrn.3142323

Ogunfuwa, I. (2017, December 21). Despite massive investment, broadband plan totters *The Punch*. https://punchng.com/despite-massive-investment-broadband-plan-totters/

Okeke, T. C. (2020). Productivity in the manufacturing subsector: Issues of income and employment generation for sustainable development in Nigeria. In S. O. Idowu, R. Schmidpeter, & L. Zu, (Eds.), *The future of the UN sustainable development goals* (pp. 83-98). Springer. https://doi.org/10.1007/978-3-030-21154-7_4

Okonkwo, U. U. (2020). Herbert Macaulay as the father of Nigeria's nationalism: A

Historical misnomer and misogyny regarding the role of Igbo women in the decolonization process. *Journal of International Women's Studies, 21*(1), 172-184. https://vc.bridgew.edu/jiws/vol21/iss1/14/

Okoye, S. I. (2017). *Strategies to minimize the effects of information security threats on business performance* (Order No. 10606454). Available from ProQuest Dissertations & Theses Global. (1944007406).

Olaide, A. M., Kunle, A. M., & Oluwaseun, O. M. (2017). *The assessment of the broadband services delivery in Nigeria*. The 4th Annual Big Data Analytics and Innovation Conference, Abuja, Nigeria. https://www.researchgate.net/publication/330984024_THE_ASSESSMENT_OF_THE_BROADBAND_SERVICE_DELIVERY_IN_NIGERIA

Olatona, F. A., Nwankwo, C. O., Ogunyemi, A. O., & Nnoaham, K. E. (2019). Consumer knowledge and utilization of food labels on pre-packaged food products in Lagos State. *Research Journal of Health Sciences*, *7*(1), 28-38. https://doi.org/10.4314/rejhs.v7i1.4

Onghena, P., Maes, B., & Heyvaert, M. (2018). Mixed methods single case research: State of the art and future directions. *Journal of Mixed Methods Research*, *13*(4):461-480. https://doi.org/10.1177/1558689818789530

Onwuaso, U. (2019, March 25). InfraCos to get subsidies soon— Danbatta. *Communication Week*. https://nigeriacommunicationsweek.com.ng/infracos-to-get-subsidies-soon-danbatta/

Onwuebuchi, C. (2019). New GSMA research reveals consumers' views on 5G.

Communication Week (Online). Retrieve from https://nigeriacommunicationsweek.com.ng/new-gsma-research-reveals-consumer-views-on-5g-the-future-of-devices/

Onwuegbuzie, A. J. (2020). Child-Parent research: Towards an ethical process for avoiding being PRICED out of research. *In Child-Parent Research Reimagined* (pp. 205-234). Brill Sense. https://doi.org/10.1163/9789004421721_010

Osho, G. S., & Adishi, O. (2019). The effects of macroeconomic variables on Lagos State economy: As Lagos economy goes, so goes the economy of Nigeria. *Journal of Economics, 7*(1), 1-9. https://doi.org/10.15640/jeds.v7n1a1

Oshry, B. (2007). Seeing Systems: *Unlocking the mysteries of organizational life*. San Francisco, CA: Berrett-Koehler.

Otika, U., Olise, E., & Oby, O. B. (2019). Risk perceptions and online shopping intention among Internet users in Nigeria. *Global Journal of Management and Business Research*. https://journalofbusiness.org/index.php/GJMBR/article/view/2942/2843

Ozomadu, E. A., Achonu, C. V., & Okoro, C. B. (2019). Effect of authoritative classroom management style on the performance of students in public secondary schools in Imo State. *International Journal of Management and Marketing Systems*. http://eprints.gouni.edu.ng/id/eprint/1371

Pegues, B., Alston, J., Shroads, D., & Hsu, D. (2019). *Qualitative intrinsic case study of real estate agents' failure to adopt customer relationship management system* ([Doctoral dissertation]. ProQuest Dissertations Publishing.

Pitt, C. S., Bal, A. S., & Plangger, K. (2020). New approaches to psychographic consumer segmentation. *European Journal of Marketing, 54*(2), 305-326. https://doi.org/10.1108EJM-01-20190083

Plano Clark, V. L., & Ivankova, N. V. (2016). *Mixed methods research: A guide to the field*. SAGE Publications.

Presidential Committee on Broadband. (2013). *The Nigerian national broadband plan,* FMC, Abuja, 2013 - 2018. https://www.researchictafrica.net/countries/nigeria/Nigeria_National_Broadband_Plan_2013 -2018.pdf

Qasim, M. I. (2020). The role of zakat in poverty alleviation in Nigerian society. *International Journal of Zakat and Islamic Philanthropy, 2*(1), 192–200. http://journal.zakatkedah.com.my/wp-content/uploads/2020/03/Vol2_1_20.pdf

Quartz Africa. (2018). *Nigeria has become the poverty capital of the world*. The World Poverty Clock Report. https://qz.com/africa/1313380/nigerias-has-the-highest-rate-of-extreme-poverty-globally/

Queder, F. (2020). Towards a vertically separated broadband infrastructure: The potential role of voluntary separation. *Competition and Regulation in Network Industries, 21*(3), 22. https://doi.org/10.1177/178359172090700

Rafique, H., Almagrabi, A. O., Shamim, A., Anwar, F., & Bashir, A. K. (2020). Investigating the acceptance of mobile library applications with an extended technology acceptance model (TAM). *Computers & Education, 145*, 103732. https://doi.org/10.1016/j.compedu.2019.103732

Ragab, S. E. (2016). *Information technology adoption by small business owners* (Order No. 10131797). Available from ProQuest Dissertations & Theses Global. (1800290691).

Rahman, A., & Sathi, N. J. (2020). Knowledge, Attitude, and Preventive Practices toward COVID-19 among Bangladeshi Internet Users. *Electronic Journal of General Medicine, 17*(5). https://doi.org/10.29333/ejgm/8223

Rashif, K., & Zuberi, F. (2017). Acceptance of Internet Banking Services with Respect to Security and Privacy Perceptions: An Application of TAM. *Journal of Independent Studies and Research-Computing, 15*(2), 27-37. https://doi.org/10.31645/jisrc/(2017).15.2.05

Ravitch, S. M., & Carl, N. M. (2016). *Qualitative research: Bridging the conceptual, theoretical, and methodological.* Thousand Oaks, CA: Sage Publications.

Ruffini, M., Ahmad, A., Zeb, S., Afraz, N., & Slyne, F. (2020). Virtual DBA: virtualizing passive optical networks to enable multi-service operation in true multi-tenant environments. *IEEE/OSA Journal of Optical Communications and Networking, 12(4), B63-B73.* https://doi.org/10.1364/JOCN.379894

Saleem, M. A. (2017). The impact of socio-economic factors on small business success. *Geografia-Malaysian Journal of Society and Space, 8*(1). https://doi.org/10.17687/JEB.05.01.04

Salmon, P. M., & Read, G. J. (2019). Many models thinking in systems ergonomics: a case study in road safety. *Ergonomics, 62*(5), 612-628. https://doi.org/10.1080/00140139.2018.1550214

Sandema-Sombe, C. (2019). *Relationship between perceived usefulness, ease of use, and acceptance of business intelligence systems* [Doctoral study, Walden University]. https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=9008&context=dissertations

Sanders, K. (2019). Media review: Research design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches. *Journal of Mixed Methods Research, 13*(2), 263-265. https://doi.org/10.1177/1558689817751775

Sassenberg, K., & Ditrich, L. (2019). Research in social psychology changed between 2011 and 2016: Larger sample sizes, more self-report measures, and more online studies. *Advances in Methods and Practices in Psychological Science, 2*(2), 107-114. https://doi.org/10.1177/2515245919838781

Schmidthuber, L., Maresch, D., & Ginner, M. (2020). Disruptive technologies and abundance in the service sector-toward a refined technology acceptance model. *Technological Forecasting and Social Change, 155*, 119328. https://doi.org/10.1016/j.techfore.2018.06.017

Selvarajah, C., Meyer, D., Jayakody, J. A. S. K., & Sukunesan, S. (2020). Managerial perceptions of leadership in Sri Lanka: Good management and leadership excellence as foundation for sustainable leadership capacity building in post-civil war Sri Lanka. *Sustainability, 12*(4), 1307. https://doi.org/10.3390/su12041307

Sengkhyavong, W. S. (2019). *Factors relating to the adoption of cloud computing by IT managers: A correlational study* (Order No. 13899358). Available from ProQuest

Dissertations & Theses Global. (2300645657).

Shanahan, D. E. (2020). *The role extraversion and technology propensity play in influencing intentions to participate in technologically intermediated peer-to-peer markets* (Order No. 27743495). Available from ProQuest Dissertations & Theses Global. (2387242907).

Slavin, R. E., Lake, C., Inns, A., Baye, A., Dachet, D., & Haslam, J. (2019). *A* quantitative synthesis of research on writing approaches in grades 2 to 12. *Best Evidence Encyclopedia*. http://www.bestevidence.org/word/writing_grades2to12_April_2019_full.pdf

Srguxymd, U.X.U.D.O.Q.D. (2016). Broadband ecosystem elements in techno-economic modeling and analysis of broadband access solutions for rural areas. *Technical Gazette*, 23(1), 279-290. https://doi.org/10.17559/TV-20150508131935

Suleiman, U. (2020, March 12). Pantami: Pathfinder for Nigeria's digital economy. *The Techeconomy*. https://techeconomy.ng/2020/03/opinion-pantami-pathfinder-for-nigerias-digital-economy/

Švigelj, M., Hrovatin, N., & Zorić, J. (2019). Are Internet users in Slovenia willing to pay for fast broadband, and what drives them to migrate? *Economic research-Ekonomska istraživanja, 32*(1), 1001-1018. https://doi.org/10.1080/1331677X.2019.1595081

Tashkandi, E., Zeeneldin, A., AlAbdulwahab, A., Elemam, O., Elsamany, S., Jastaniah, W., Abdullah, S., Alfayez, M., Jazieh, A. R., & Al-Shamsi, H. O. (2020). Virtual management of patients with cancer during the COVID-19 pandemic: Web-based

questionnaire study. *Journal of Medical Internet Research*, *22*(6), e19691. https://doi.org/10.2196/19691

Teniola, O. (2017, June 2). *The impact of broadband on the Nigerian economy: Citing best practices*. Business Day Broadband Summit, 2017. https://businessday.ng/exclusives/article/experts-discuss-broadband-enabler-economic-growth-businessday-broadband-summit/

Thomas, M. L. (2020). *Hotel water management in California* (Doctoral dissertation, Walden University). https://search.proquest.com/openview/124630d41788f6c74cfa5212009b43e4/1?pq-origsite=gscholar&cbl=18750&diss=y

Tourish, D. (2019). Is complexity leadership theory complex enough? A critical appraisal, some modifications, and suggestions for further research. *Organization Studies*, *40*(2), 219-238. https://doi.org/10.1177/0170840618789207

Townsend, L., Wallace, C., & Fairhurst, G. (2015). 'Stuck out here': The critical role of broadband for remote rural places. *Scottish Geographical Journal*, *131*(3-4), 171-180. https://doi.org/10.1080/14702541.2014.978807

Tugbiyele, K. (2019). *Increasing 4G network infrastructure in Nigeria to improve e-commerce* (Doctoral dissertation, George Washington University). https://search.proquest.com/openview/568f4354b4e2f313f85f0d09e631e350/1?pq-origsite=gscholar&cbl=18750&diss=y

Turner, S. F., Cardinal, L. B., & Burton, R. M. (2017). Research design for mixed methods: A triangulation-based framework and roadmap. *Organizational*

Research Methods, 20(2), 243-267. https://doi.org/10.1177/1094428115610808

Ubabukoh, O. (2017, December 26). The seven major Internet-of-things trends for 2017. *The Punch*. https://punchng.com/seven-major-Internet-things-trends-2017-2/

Uhl-Bien, M., & Marion, R. (Eds.). (2008). *Complexity leadership, part 1: Conceptual foundations*. Charlotte, NC: Information Age.

Umeh, J. (2019). How viable tech ecosystem can facilitate Nigeria's economic growth. *Vanguard*. https://www.vanguardngr.com/2019/06/how-viable-tech-ecosystem-can-facilitate-nigerias-economic-growth/

Umezuruike, C., Oludele, A., Kuyoro, S. O., & Izang, A. A. (2015). Broadband Internet penetration in Nigeria: a review. *International Journal of Research Studies in Computer Science and Engineering*, *2*(1), 1-7. https://www.arcjournals.org/pdfs/ijrscse/v2-i1/1.pdf

Urama, N. E., & Ogbu, O. (2018). Evaluating consumer perception and willingness to pay for broadband in Nigeria. *Telecommunications Policy*. https://doi.org/10.1016/j.telpol.2018.03.009

U.S. Embassy in Nigeria. (2018). *Nigeria fact sheet.* https://photos.state.gov/libraries/nigeria/487468/pdfs/Nigeria%20overview%20Fact%20Sheet.pdf

Van Woensel, L. (2020). Systems thinking and assessing cross-policy impacts. In *A bias radar for responsible policymaking* (St. Antony's Series). Palgrave Pivot. 69-89. https://doi.org/10.1007/978-3-030-32126-0_4

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology

acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186-204. https://doi.org/10.1287/mnsc.46.2.186.11926

Von Bertalanffy, L. (1972). The history and status of general systems theory. *Academy of Management Journal, 15*(4), 407-426. https://doi.org/10.2307/255139

Wamuyu, P. K. (2017). Closing the digital divide in low-income urban communities: A domestication approach. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, *13*, 117-142. https://doi.org/10.28945/3885

Wang, F., Huang, G. H., Fan, Y., & Li, Y. P. (2020). Robust subsampling ANOVA methods for sensitivity analysis of water resource and environmental models. *Water Resources Management, 34*(10), 3199-3217. https://doi.org/10.1007/s11269-020-02608-2

Wang, Y., Wang, S., Wang, J., Wei, J., & Wang, C. (2020). An empirical study of consumers' intention to use ride-sharing services: using an extended technology acceptance model. *Transportation, 47*(1), 397-415. https://doi.org/10.1007/s11116-018-9893-4

Wang, Z., & Dang, M. (2019). Evaluation of rural broadband network based on broadband universal service management system. *China Communications, 16*(8), 51-57. https://doi.org/10.23919/JCC.2019.08.005

Warner, R. M. (2020). *Applied statistics II: Multivariable and multivariate techniques*. SAGE Publications.

Wiley, J. (2006). *Broadband optical access networks and fiber-to-the-home: Systems Technologies and deployment strategies*. England. Southern Gate Publisher Press.

Wilson, G., & Idoniboy-Obu, S. A. (2019). Local government autonomy as a strategy for socio-economic development of rural communities in Nigeria. *KIU Journal of Social Sciences, 5*(1), 117-126. https://www.ijhumas.com/ojs/index.php/kiujoss/article/view/482

World Bank. (2020a). *Global economic prospects 2020*: *Slow Growth Policy Challenges*. http://pubdocs.worldbank.org/en/187381574888061916/Global-Economic-Prospects-January-2020-Regional-Overview-SSA.pdf

World Bank. (2020b). *Nigeria Overview 2020*: The World Bank in Nigeria. https://www.worldbank.org/en/country/nigeria/overview

World Bank. (2020c). *January 2020 global economic prospects: Slow growth, policy challenges*. https://www.worldbank.org/en/news/feature/2020/01/08/january-2020-global-economic-prospects-slow-growth-policy-challenges

World Economic Forum. (2019). *The global competitiveness report 2019*. http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

Worldometer. (2020). The population of Nigeria; 2020 and historical. https://www.worldometers.info/world-population/nigeria-population/

World Population Review. (2019). *Nigeria population*. http://worldpopulationreview.com/countries/nigeria/

Youthhub Africa. (2020). *2020 fact sheet reforming basic education in Nigeria*. Youth Hub Africa. https://www.slideshare.net/youthhubafrica/2020-fact-sheet-reforming-basic-education-in-nigeria

Zetting, P., Zander, U., Zander, L., & Mockaitis, A. (2020). A World of Learning: A

future for leaders who can make a difference based on European foundations. *Research handbook of global leadership: Making a difference*., 393-407. ttps://doi.org/10.4337/9781782545354

Appendix A: Data Collection Instrument

Topic: Complexity Thinking and Broadband Internet Penetration in Lagos, Nigeria

PART I: Demographic Information

Please indicate by ticking [√]

1. Indicate your gender:
   - Male [ ]
   - Female. [ ]
2. Indicate your local community of residence in Lagos State:
   - Gowon Estate - Alimosho [ ]
   - Igbe - Ikorodu [ ]
   - Idumagbo – Lagos Island [ ]
3. Your Age:
   - 18 – 30 [ ]
   - 31 - 45 [ ]
   - 46 - 55 [ ]
   - 56 and above [ ]
4. Highest educational qualification:
   - Primary School Certificate [ ]
   - GCE/SSCE [ ]
   - OND/NCE [ ]
   - HND/BSc [ ]
   - Master Degree [ ]
   - Doctorate Degree [ ]
5. I am a community leader [ ]
6. I am a community member [ ]
7. Do you use internet services (voice, data, video) either mobile or fixed?

   Yes [ ] No [ ] thinking about it [ ]

PART II: Survey Instrument

Topic: Complexity Thinking and Broadband Internet Penetration in Lagos, Nigeria

Besides each of the statements on broadband Internet penetration, please indicate whether you agree or disagree with each statement by selecting the appropriate number on the scale of 1 (strongly disagree), 2 (disagreed), 3 (Neutral), 4 (agreed), and 5 (strongly agree) that most closely matches your perception of broadband Internet penetration adoption.

		1	**2**	**3**	**4**	**5**
(i) Statements used to Measure Perceived Usefulness (PU)		**SD**	**D**	**N**	**A**	**SA**
1	The deployment of broadband Internet technology infrastructure would make it easier to do my job.	☐	☐	☐	☐	☐
2	The deployment of broadband Internet technology infrastructure would be useful for my job.	☐	☐	☐	☐	☐
3	Broadband Internet technology infrastructure deployment would improve productivity.	☐	☐	☐	☐	☐
(ii) Measurement of Perceived Ease of Use (PEoU)		**1**	**2**	**3**	**4**	**5**
1	Interaction with broadband Internet technology would be clear to understand.	☐	☐	☐	☐	☐
2	Navigating broadband Internet technology would be easy	☐	☐	☐	☐	☐
3	Broadband Internet technology would be easy to learn to use.	☐	☐	☐	☐	☐

4	Broadband Internet technology would make it easy to perform a task	☐	☐	☐	☐	☐

(iii) Statements used to Measure Perceived Benefit (PB)		**1**	**2**	**3**	**4**	**5**
1	Broadband Internet technology infrastructure deployment would improve productivity will provide a significant benefit to my community	☐	☐	☐	☐	☐
2	Broadband Internet technology infrastructure deployment will provide a higher return on investment to businesses	☐	☐	☐	☐	☐
3	Broadband Internet technology infrastructure deployment to meet my community IT needs	☐	☐	☐	☐	☐

(iv) Statement used to Measure Perceived Security		**1**	**2**	**3**	**4**	**5**
1	I feel that broadband Internet technology is secured	☐	☐	☐	☐	☐
2	I would be concerned about Broadband Internet technology security	☐	☐	☐	☐	☐
3	Feel that Broadband Internet technology is more secured than narrowband technology	☐	☐	☐	☐	☐
4	I feel confident to use broadband Internet technology	☐	☐	☐	☐	☐

(v) Statements used to Measure Behavioral intention to allow Broadband Internet Infrastructure Deployment		**1**	**2**	**3**	**4**	**5**
1	I am not willing to allow broadband Internet technology infrastructure deployment in my community	☐	☐	☐	☐	☐

2	I will like to spend some time learning how to use broadband Internet technology for the benefit of my community	☐	☐	☐	☐	☐
3	I am not willing to use broadband Internet technology even if it is secured for my community	☐	☐	☐	☐	☐

Appendix B: Permission to Adopt Survey Instrument

Re: USING SURVEY INSTRUMENT FOR DISSERTATION

James Akpoja <james.akpoja@waldenu.edu>
Fri 10/23/2020 9:46 AM
To:

- Williams T Obinkyereh <obinkytt@yahoo.co.uk>

Thank you so much for your support, Dr. Obinkyereh.

I will sure cite your work and share the result of my study with you after successful completion.

Kind Regards,

James Akpoja
Student. Ph.D. in Management
E - james.akpoja@waldenu.edu
T- +2348023312197
Skype - jaakpoja

From: Williams T Obinkyereh <obinkytt@yahoo.co.uk>
Sent: Friday, October 23, 2020, 9:13 AM
To: James Akpoja <james.akpoja@waldenu.edu>
Subject: Re: USING SURVEY INSTRUMENT FOR DISSERTATION

Hi James.

I am happy to hear you want to adopt my survey instrument for your dissertation. You are free to use it provided you site my work.

I wish you good luck.

Thanks

Dr. Williams Obinkyereh
On Friday, October 23, 2020, 05:52:19 AM CDT, James Akpoja <james.akpoja@waldenu.edu> wrote:

Dear Dr., Obinkyereh,

I hope this email meets you well and you are keeping safe.
My name is James Akpoja a Ph.D. in Management student at Walden University. I am proposing a study with the topic, "Complexity thinking and broadband Internet penetration in Lagos, Nigeria. I conducted an extensive library search and found your survey instrument on "Cloud Computing Adoption in Ghana: A Quantitative Study based on Technology Acceptance Model (TAM)" suitable to help me survey the proposed participants for my study.

I intend to operationalize your predictor variables with community members' and leader's behavioral intentions to allow broadband infrastructure deployment in their local community.
I wish you would accept to permit me to proceed while assuring me of the provision of necessary assistance to be able to use the instrument once I secure the University's Institutional Review Board's approvals to proceed with the field data gathering. I will be waiting for your feedback, as I am thankful for your goodwill to help.

Kind Regards,

James Akpoja
Student. Ph.D. in Management
E - james.akpoja@waldenu.edu
T- +2348023312197
Skype – jaakpoja

Re: REPUBLISHING SURVEY INSTRUMENT IN MY DISSERTATION

James Akpoja <james.akpoja@waldenu.edu>
Thu 9/2/2021 6:14 PM
To:

- Williams T Obinkyereh <obinkytt@yahoo.co.uk>

Thank you so much, Dr. Williams. I sincerely appreciate it.

Kind Regards,

James Akpoja
Student. Ph.D. in Management
E - james.akpoja@waldenu.edu
T- +2348023312197
Skype - jaakpoja

From: Williams T Obinkyereh <obinkytt@yahoo.co.uk>
Sent: Thursday, September 2, 2021, 3:36 PM
To: James Akpoja <james.akpoja@waldenu.edu>
Subject: Re: REPUBLISHING SURVEY INSTRUMENT IN MY DISSERTATION

Thank you for contacting me.
I am writing this email to grant you permission to use my survey instrument in your dissertation.

I hereby grant you permission to use my survey questionnaire in your study

You can print and use this email as evidence of permission granted.

I wish you Good Luck in your studies

Yours Faithfully,
Dr. Williams Obinkyereh
On Wednesday, September 1, 2021, 06:00:15 PM CDT, James Akpoja <james.akpoja@waldenu.edu> wrote:

Dear Dr. Williams,

I trust you are well and safe amidst the global health challenges.

The email subject refers. I am at the final stage of my dissertation approvals and my institution requires me to show permission for republishing the survey questionnaire in my study.

The permission to use is considered differently from reprinting the same instrument as an appendix in the study.

Kindly respond to this email to grant me permission.

Kind Regards,

James Akpoja
Student. Ph.D. in Management
E - james.akpoja@waldenu.edu
T- +2348023312197
Skype - jaakpoja

Appendix C: Data Reliability Statistics

Table 40

Reliability Statistics and Case Processing Summary

Reliability statistics

Cronbach's alpha	Cronbach's alpha based on standardized items	*N* of items
.895	.898	17

Case processing summary

		N	%
Cases	Valid	144	100.0
	Excluded[a]	0	.0
	Total	144	100.0

a. Listwise deletion based on all variables in the procedure.

Table 41

Perceived Usefulness Reliability Statistics

Cronbach's alpha	Cronbach's alpha based on standardized items	*N* of Items
.810	.814	3

Table 42

Perceived Usefulness Item Statistics

	Mean	Std. Deviation	N
PU1-The deployment of broadband Internet technology infrastructure would make it easier to do my job	4.7014	.51658	144
PU2-The deployment of broadband Internet technology infrastructure would be useful for my job.	4.7083	.52723	144
PU3-Broadband Internet technology infrastructure deployment would improve productivity.	4.6181	.59127	144

Table 43

Perceived Usefulness Inter-Item Correlation Matrix

	PU2	PU1	PU3
PU1-The deployment of broadband Internet technology infrastructure would make it easier to do my job	.679	1.000	.563
PU2-The deployment of broadband Internet technology infrastructure would be useful for my job.	1.000	.679	.537
PU3-Broadband Internet technology infrastructure deployment would improve productivity.	.537	.563	1.000

Table 44

Perceived Usefulness Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PU1-The deployment of broadband Internet technology infrastructure would make it easier to do my job	9.3264	.963	.704	.516	.696
PU2-The deployment of broadband Internet technology infrastructure would be useful for my job.	9.3194	.960	.682	.497	.716
PU3-Broadband Internet technology infrastructure deployment would improve productivity.	9.4097	.915	.600	.361	.809

Table 45

Perceived Ease of Use Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.790	.788	4

Table 46

Perceived Ease of Use Item Statistics

	Mean	Std. Deviation	N
PEoU1-Interaction with broadband Internet technology would be clear to understand.	4.4236	.65398	144
PEoU2-Navigating broadband Internet technology would be easy	4.4236	.69544	144
PEoU3-Broadband Internet technology would be easy to learn and to use.	4.4375	.62264	144
PEoU4-Broadband Internet technology would make it easy to perform a task	4.6528	.51981	144

Table 47

Perceived Ease of Use Inter-Item Correlation Matrix

	PEoU1	PEoU2	PEoU3	PEoU4
PEoU1-Interaction with broadband Internet technology would be clear to understand.	1.000	.679	.469	.497
PEoU2-Navigating broadband Internet technology would be easy	.679	1.000	.506	.352
PEoU3-Broadband Internet technology would be easy to learn and to use.	.469	.506	1.000	.386
PEoU4-Broadband Internet technology would make it easy to perform a task	.497	.352	.386	1.000

Table 48

Perceived Ease of Use Item-Total-Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PEoU1-Interaction with broadband Internet technology would be clear to understand.	13.5139	2.084	.709	.543	.678
PEoU2-Navigating broadband Internet technology would be easy	13.5139	2.056	.657	.507	.708
PEoU3-Broadband Internet technology would be easy to learn and to use.	13.5000	2.392	.556	.314	.759
PEoU4-Broadband Internet technology would make it easy to perform a task	13.2847	2.737	.490	.278	.788

Table 49

Perceived Benefit Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.776	.779	3

Table 50

Perceived Benefit Item Statistics

	Mean	Std. Deviation	N
PB1-Broadband Internet technology infrastructure deployment would improve productivity and provide a significant benefit to my community	4.6319	.57630	144
PB2-Broadband Internet technology infrastructure deployment would provide a higher return on investment to businesses in my community	4.4722	.63625	144
PB3-Broadband Internet technology infrastructure deployment would meet my community IT needs	4.4861	.67922	144

Table 51

Perceived Benefit Inter-Item Correlation Matrix

	PB1	PB2	PB3
PB1-Broadband Internet technology infrastructure deployment would improve productivity and provide a significant benefit to my community	1.000	.573	.514
PB2-Broadband Internet technology infrastructure deployment would provide a higher return on investment to businesses in my community	.573	1.000	.533
PB3-Broadband Internet technology infrastructure deployment would meet my community IT needs	.514	.533	1.000

Table 52

Perceived Benefit Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PB1-Broadband Internet technology infrastructure deployment would improve productivity and provide a significant benefit to my community	8.9583	1.327	.619	.389	.694
PB2-Broadband Internet technology infrastructure deployment would provide a higher return on investment to businesses in my community	9.1181	1.196	.633	.405	.673
PB3-Broadband Internet technology infrastructure deployment would meet my community IT needs	9.1042	1.157	.591	.349	.726

Table 53

Perceived Security Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.676	.677	4

Table 54

Perceived Security Item Statistics

	Mean	Std. Deviation	N
I feel that broadband Internet technology is secured	4.1528	.83053	144
I would be concerned about Broadband Internet technology security	4.2986	.71036	144
I feel that Broadband Internet technology is more secured than narrowband Internet technology	4.1736	.83900	144
I feel confident to use broadband Internet technology	4.4167	.62017	144

Table 55

Perceived Security Inter-Item Correlation Matrix

	PS1	PS2	PS3	PS4
PS1-I feel that broadband Internet technology is secured	1.000	.147	.524	.459
PS2-I would be concerned about Broadband Internet technology security	.147	1.000	.182	.192
PS3-I feel that Broadband Internet technology is more secured than narrowband Internet technology	.524	.182	1.000	.559
PS4-I feel confident to use broadband Internet technology	.459	.192	.559	1.000

Table 56

Perceived Security Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
I feel that broadband Internet technology is secured	12.8889	2.561	.518	.316	.567
I would be concerned about Broadband Internet technology security	12.7431	3.563	.209	.046	.751
I feel that Broadband Internet technology is more secured than narrowband Internet technology	12.8681	2.395	.589	.406	.511
I feel confident to use broadband Internet technology	12.6250	3.019	.568	.357	.557

Table 57

Behavioral Intention for Broadband Internet Infrastructure Deployment Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.681	.681	3

Table 58

Behavioral Intention for Broadband Internet Infrastructure Deployment Item Statistics

	Mean	Std. Deviation	N
I am willing to allow broadband Internet technology infrastructure deployment in my community	4.4514	.49937	144
I would like to spend some time learning how to use broadband Internet technology for the benefit of my community	4.4931	.50170	144
I am willing to use broadband Internet technology if it is secured for my community	4.4514	.49937	144

Table 59

Behavioral Intention for Broadband Internet Infrastructure Deployment Inter-Item Correlation Matrix

	BI1	BI2	BI3
BI1-I am willing to allow broadband Internet technology infrastructure deployment in my community	1.000	.362	.411
BI2-I would like to spend some time learning how to use broadband Internet technology for the benefit of my community	.362	1.000	.473
BI3-I am willing to use broadband Internet technology if it is secured for my community	.411	.473	1.000

Table 60

Behavioral Intention for Broadband Internet Infrastructure Deployment Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
I am willing to allow broadband Internet technology infrastructure deployment in my community	8.9444	.738	.450	.205	.642
I would like to spend some time learning how to use broadband Internet technology for the benefit of my community	8.9028	.704	.497	.257	.583
I am willing to use broadband Internet technology if it is secured for my community	8.9444	.682	.536	.290	.531

Appendix D: Permission to Reprint Graphs

Re: PERMISSION TO REPRINT GRAPHS: OKR/Formal Publication/N

James Akpoja <james.akpoja@waldenu.edu>
Fri 9/3/2021 3:50 PM
To:
Pubrights <pubrights@worldbank.org>

Dear Mayya,

Thank you so much for the swift response.

I have successfully accessed the permission through the link you shared in your email; https://creativecommons.org/licenses/by/3.0/igo/

I sincerely appreciate your support.

Kind Regards,

James Akpoja
Student. Ph.D. in Management
E - james.akpoja@waldenu.edu
T- +2348023312197
Skype - jaakpoja

From: Pubrights <pubrights@worldbank.org>
Sent: Friday, September 3, 2021, 11:43 AM
To: James Akpoja <james.akpoja@waldenu.edu>
Subject: RE: PERMISSION TO REPRINT GRAPHS: OKR/Formal Publication/N

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From: James Akpoja <james.akpoja@waldenu.edu>
Sent: Wednesday, September 01, 2021, 11:36 AM
To: Pubrights <pubrights@worldbank.org>
Subject: PERMISSION TO REPRINT GRAPHS

[External]
Dear Sir/Madam,

My name is James Akpoja, a Ph.D. Management student at Walden University.

I presently embark on research with the topic "Complexity Thinking and Broadband Internet Penetration in Lagos, Nigeria." I found the graphs in your book, "*Broadband Strategies Handbook*, by T. Kelly, & C. M. Rossotto, 2012, p. 6-7" useful to be reprinted for my study.

Kindly permit me to reprint and cite these graphs to explain the effect of broadband Internet on the GDP of my country.

I will be glad if this request is considered and the permission granted

Kind Regards,

James Akpoja
Student. Ph.D. in Management
E - james.akpoja@waldenu.edu
T- +2348023312197
Skype - jaakpoja

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