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A Quantitative Model of Smartphone Adoption Among Urban and Rural Nigerians: The Role of Social Context In Ensuring Continuous Usage

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ABSTRACT

Rapid diffusion and adoption of smartphone technologies could accelerate development in developing nations like Nigeria. Much is known about the factors that influence technology adoption and continuous use in general, but these theories of socio-economic impact have rarely been tested in Nigeria. Additionally, there may be differences in technology adoption and use behaviors between urban and rural settings. Such differences could influence strategies for encouraging widespread smartphone adoption in Nigeria. Therefore, the present quantitative, survey study sought to test a theoretical model of smartphone adoption and continuous use based on the unified theory of acceptance and use of technologies as well as on expectation confirmation theory. Using factor analysis and partial least squares analysis, this research tested a set of hypotheses related to intention to use smartphones and continuous use, exploring the moderating role of urban versus rural locations. The study discovered that, among Nigerians with high performance expectancy, those who lives in urban areas are more likely to intend to use smartphones when compared with their rural counterparts. The study concluded that social, socio-economic, and infrastructure factors enable urban dwellers to utilize smartphones, whereas context factors make smartphone adoption more difficult in rural areas. That is social influence was positively correlated with intention to use smartphones. Additionally, there is a strong positive correlation between intent to use and continuous usage of mobile technologies, justifying intent to use as an important outcome variable in research on technology adoption in Africa. Based on the results of the finding, this work recommends amongst others, that adequate Information Technology Infrastructure should be planned on a continuous basis for deployment in the rural areas.

Keywords:

Qualitative Model, Smartphones Adoption, Mobile Technologies, Social Context, Performance Expectancy, Expectation Confirmation Theory, Unified Theory of Acceptance

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I. INTRODUCTION

Information and Communication Technology (ICT) continues to reshape the social scenery of human life [1], and it has grown to become a major enabler for national progress and social transformation [2]. Mobile technology is especially important in this context because it enables adoption of advanced technology in areas where immediate prior technology has not been adopted; this is called technology leapfrogging [3]. Technology especially mobile telephony leapfrogging increase the pace of a country's economic development, thereby narrowing the gap between developed and developing nations [3]. It is therefore important to understand the characteristics of technology adoption in environments characterized by technology leapfrogging. This is because creating conditions to enable technology adoption in developing areas could play an important role in accelerating development. The aim of this study is to test a model of intention to use technology and continuous use of smartphones among rural and urban dwellers in a developing area. The goal is to validate the applicability of existing theoretical work to developing nations. Also to provide stakeholders with insights into the conditions required for large scale adoption of mobile technologies.

Nigeria is chosen for this study because it is the most populous country with the biggest economy in Africa; it is also among the countries with the fastest smartphone penetration rate in the world. Nigeria is located in West Africa and shares borders with the republic of Benin in the west, Chad and Cameroon in the east, and Niger Republic in the north; its coast in the south lies on the Gulf of Guinea on the Atlantic Ocean, therefore, there is high proliferation of technology usage. The country comprises 36 states and the Federal Capital Territory, with a

total population of 174 million inhabitants which makes it a good population size for technology based research.

The remaining part of this article proceeds as follows: Section 2 presents the background and theoretical framework, which is primarily based on the unified theory of acceptance and use of technology. Next, Section 3, presents the methodology and hypotheses used, Section 4 discusses the results of the work while Section 5 gives the conclusion and recommendation for further works.

II. BACKGROUND AND THEORY

Most existing technology adoption theories focus on the initial adoption of technology, with little attention paid to the users' behavioral attitude after the initial adoption and usage. With this comparative study, the research aims for a better understanding of the intention to use and continuous use of smartphones among urban and rural adopters / subscribers in Nigeria. An integration of a pre- and post-adoption theories was therefore considered most suitable for this study. The study focuses on a heretofore understudied user population (i.e. consumers in Nigeria in Sub-Saharan Africa); therefore, it was appropriate to adapt the Unified Theory of Acceptance and Use of Technology (UTAUT). In exploring intention to use smartphones among urban and rural Nigerians, the research considered the effects of Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Price Value, and Habit. In the following section, vivid descriptions of the UTAUT and the constructs are provided in more detail.

A. Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT derives from the seminal work of Venkatesh *et al.* [4]. It represents a synthesis of eight major theories, tested on real-world

datasets based on critical factors and social factors [9].

contingencies relating to the prediction of intention to use technology. The theory has been widely applied across disciplines [5] and is ever-evolving through the incorporation of new constructs and adaption to new settings [6].

The UTAUT describes how determinants of intention to use a technology are expressed over time. The major constructs in the model are Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC) [4]. The enhanced UTAUT adds Habit and Price Value to the previous four constructs. Together, these constructs synthesize what is known about technology acceptance and use; and incorporate constructs from several other competing theories. For example, PE incorporates elements of behavioral beliefs (important to the theory of reasoned action and the theory of planned behavior) and perceived usefulness (a key construct in the technology acceptance model), relative advantage (innovation diffusion theory), and outcome expectations (social cognitive theory) [7]. For this reason, the UTAUT is a powerful theoretical model for studying technology adoption.

Based on the aforementioned theories, this study explores the reasons for a gap between initial adoption and post-adoption behavior, because the incorporation of expectancy variables is especially important. Pre-adoption technology expectations are important in predicting satisfaction and continuous use. Consumers form some expectations about a product or service before they make a purchase decision. Consumers' perceptions are formed when they compared their original expectations with their initial consumption experiences [8]. A major strength of the UTAUT is its incorporation of expectancy factors alongside economic and

One shortcoming of the UTAUT is that it does not incorporate cultural differences [10]. However, the UTAUT has been widely used in developing countries, including in Africa, with good success predicting technology adoption and continuous use [11-16]. Additionally, the incorporation of personal factors to some extent overcome this weakness. In quantitative models using the UTAUT, age, gender, experience, and voluntariness are considered as moderators. Gender, long omitted from Information Technology (IT) behavioral research, was found to have a significant effect on technology adoption. Venkatesh and Morris (2000) posited that women and men process information differently using different socially constructed cognitive structures.

B. Socioeconomic Growth and Satisfaction

The UTAUT focuses on the pre-adoption factors that predict technology adoption and use. It does not explore the post-adoption factors related to continued use, nor does it take into account the consequences of use. Oliver's (1980) expectation confirmation theory (ECT) overcomes this weakness by positing that confirmation of pre-adoption expectations leads to satisfaction with a technology, which predicts continued use of that technology. Dissatisfaction occurs when buyer expectations are not met, resulting in the discontinuation of use [17]. Initial expectations may become less relevant over time, as user perceptions are increasingly built upon the performance of the product [9]. Satisfaction is incorporated into the model to contribute to the explanation of continuous usage after initial adoption.

In developing countries, smartphone adoption is significantly predicted by the cost of acquiring and maintaining the devices [18]. Kim *et al.* [19]

concluded that socio-economic effects are the most important predictors of technology adoption in developing countries, where comparatively higher costs and fees present a structural barrier to adoption. However, the body of literature related to the economics of mobile phone use in sub-Saharan Africa has suggested that mobile technology leads to improved business performance, information access, and marketing access [20], and that therefore mobile phones support livelihoods in this region [21, 22]. Scholars have also argued that the benefits from mobile technology adoption might be proportionately greater in resource-constrained settings such as rural areas when compared with urban areas [23]. Therefore, the research work incorporated socioeconomic growth as an outcome variable, positing that, among rural Nigerians, smartphone adoption should lead to greater socio-economic growth than among urban Nigerians. However, according to the theoretical framework presented here, relationships leading to continuous use should be stronger in urban settings, owing to greater contextual and socio-economic support for technology adoption. Therefore, this work hypothesized that all relationships would be moderated by urban versus rural locale (see section 3 for full list of hypotheses). Figure 1 presents the theoretical model used in this study.

III. METHODOLOGY

Using a theoretical model of continuous smartphone use and satisfaction among rural and urban Nigerians, the following hypotheses were tested:

H1a: *There is a positive relationship between performance expectancy and intention to use smartphones.*

H1b: *Locale (rural, urban) moderates a positive relationship between performance expectancy and intention to use smartphones to the extent*

that the effect is stronger among urban adopters than rural adopters.

H2a: *There is a positive relationship between social influence and intention to use smartphones.*

H2b: *Locale (rural, urban) moderates a positive relationship between social influence and intention to use smartphones to the extent that the effect is stronger among urban adopters than rural adopters.*

H3a: *There is a positive relationship between price value and intention to use smartphones.*

H3b: *Locale (rural, urban) moderates a positive relationship between price value and intention to use smartphones to the extent that the effect is stronger among urban adopters than rural adopters.*

H4a: *There is a positive relationship between habit and intention to use smartphones.*

H4b: *Locale (rural, urban) moderates a positive relationship between habit and intention to use smartphones to the extent that the effect is stronger among urban adopters than rural adopters.*

H5: *There is a positive relationship between intention to use smartphones and continued smartphone usage.*

H6a: *There is a positive relationship between continued usage of smartphones and satisfaction.*

H6b: *Locale (rural, urban) moderates a positive relationship between continued usage of smartphones and satisfaction to the extent that the effect is stronger among urban adopters than rural adopters.*

H7a: *There is a positive relationship between socioeconomic growth and continued usage of smartphones.*

H7b: *Locale (rural, urban) moderates a positive relationship between socioeconomic growth and continued usage of smartphones to the extent*

that the effect is stronger among rural adopters than urban adopters.

A. Sample and Setting

The target population for this study was smartphone users in Nigeria. According to NCC (2014), there are 180 million mobile phone subscribers in Nigeria. Smartphone penetration stands at 25% of 180 million; therefore, the estimated population for this study was 45 million. The population was subdivided into two categories: rural and urban residents. The potential participants were required to be at least 18 years old, own and use a smartphone, and be able to express themselves in English. The participants in the study came from Lagos State of Nigeria. Lagos state was chosen as the representative state for three reasons: (a) it is the most populous state in Nigeria, (b) it is a cosmopolitan state, and (c) it is the commercial capital of Nigeria. Additionally, at the time of study, Lagos is the only Nigerian state with an available 4G-smartphone network, and Lagos State is also the only state that complied with this criterion.

A stratified sampling method was used to arrive at a target sample size of 385 for a 95% confidence level [24]. Potential participants were selected from 12 Local Government Authorities (LGAs) out of a total of 20 local governments in Lagos State. Fifteen of the 20 LGAs are in the Lagos metropolis. To ensure proportionate selection, 9 LGA were randomly selected out of the 15 LGAs in the metropolis and three of the five local government councils in the rural areas. Table 1 summarizes the stratified sampling by LGA.

B. Data Collection

Data were collected over a period of 19 days in 2015. The survey instrument was distributed to 657 people, of whom 442 returned the survey, for a response rate of 67.28%. The initial

identification, contact, and screening of participants for this study occurred through face-to-face and Web-based methods. A Web-based survey was accessible via a link to SurveyMonkey. An introductory letter stating the purpose of the survey in Lagos State, Nigeria, was attached to each copy of the survey. The links remained active for 7 days. Face-to-face distribution of survey occurred simultaneously. The survey was distributed in major offices, event centers, public places such as government offices, schools, hospitals, local government offices, eateries in the selected local government headquarters, and various trade associations and gatherings. The demographic information collected included age, gender, education, income level, profession, and location. Potential participants were handed a survey as they arrived in the described places; they were asked to fill out the survey and submit it as they left.

A 49-item survey was used to collect data. The survey included questions that measured the impact of smartphone technology and the adopters' attitudes during the pre- and post-adoption phases. The questions were distributed as follows: demographic and baseline usage questions, items 1–16; performance expectancy, items 17–20; social influence items 21–23; price value, items 24–26; habit, items 27–29; behavioral intention and continued usage, items 30–35; satisfaction, items 36–43; socioeconomic growth, items 44–49. With the exception of demographic items, all questions were scored on a 5-point Likert scale. Small modifications were made to the instruments developed by Venkatesh *et al.* (2012) and Bhattacharjee (2001). Venkatesh *et al.* (2012) used Smart-PLS software to examine the measurement model in order to assess reliability and validity. The internal consistency

reliabilities (ICRs) of multi-item scales modeled with reflective indicators was 0.75; the average variance extracted (AVE) was greater than 0.70 in all cases and greater than the square of the correlations, indicating discriminant validity. Bhattacharjee (2001) on online banking division (OBD) of one of the largest national bank in U.S for research administration. While the Venkatesh *et al.* (2012) instrument was administered to mobile phones users in Hong Kong, their instrument was published in English to ensure content validity. Bhattacharjee (2001) ensured reliability of his instrument by examining the goodness-of-fit of a confirmatory model, with strong results.

This work developed survey questions on the socio-developmental effect of smartphone use that were not part of the work of the original authors. Also, location and economic status were used as moderator variables. The survey was simplified to enable participants to easily follow and understand the questions provided in the English language.

Because the items were predominantly adapted from previous research studies, there was no conduct of a full pilot study using the research instrument. However, this work pilot the distribution method and understandability of the survey by administering the survey to a pilot sample of 80 participants in the target population. The responses demonstrated good engagement (i.e., sufficiently high standard deviations in response sets) and the variables were sufficiently normally distributed. Therefore, this research considered the survey to be acceptable to gather data on the variables of interests for this study.

C. Data Analysis

This study involved multivariate data: five independent and three dependent variables were used to reveal patterns in the pre- and

post-adoption behavior of smartphone adopters. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were used to test the fit of hypothesized measurement model [25]. A Partial Least Squares (PLS) statistical technique was used to test the hypotheses. PLS is a multivariate technique capable of uncovering patterns in complex, exploratory models. This research adopted and used the procedure developed by Fornell and Larcker (1981) to examine discriminant validity of the constructs. Smart-PLS software was used to calculate descriptive and inferential statistics. For hypotheses 1–4, 6, and 7, Fisher's *z* test was used for differences between correlations to determine whether the relationships of interest were different between rural and urban dwellers. For hypothesis 5, regression analysis was used to determine the regression weight and significance level of the hypothesized path.

4. RESULTS AND DISCUSSION

A. Factor Analysis

All variables met acceptability criteria for normality and reliability, as measured using the skewness statistic and Cronbach's α , respectively. Table 2 summarizes normality and reliability statistics. Before testing the hypotheses, the measurement model was developed using Exploratory Factor Analysis (EFA) with principal component calculations and the Varimax rotation. Using Kaiser's criterion (eigenvalue > 1), the EFA solution yielded an 8-factor solution, with the ninth factor (eigenvalue = 0.950) adding nearly 3% to the cumulative variance explained, such that the 9-factor solution explained 67.613% of the variance in the data. These nine factors were clearly interpretable; therefore, the 9-factor solution was retained. Table 3 presents the eigenvalues and percentages explained by the nine factors. Examining the factor loadings and

Table 1: Allocation of Sample Size to Strata (Selected Local Government Areas)

Stratum	Local Government Area	2006 Population	Sample Size
1	Urban Areas Agege	1,329,122	36
2	Ajeromi/Ifelodun	1,846,625	51
3	Ifako/Ijaye	957,633	26
4	Kosofe	1,202,458	33
5	Lagos Mainland	809,864	22
6	Mushin	1,700,240	47
7	Oshodi/Isolo	1,459,689	40
8	Shomolu	1,318,905	36
9	Surulere	1,639,572	45
	<i>Rural Areas</i>		
10	Ikorodu	886,513	24
11	Badagry	489,442	13
12	Epe	416,382	11
	Total Population of the selected LGAs	14,056,445	385

Note. Calculation of sample size was based on the population figures extracted from the 2012 publication “Abstract of Local Government Statistics,” Lagos Bureau of Statistics, Ministry of Economic Planning and Budgeting in 2012.

Table 2: Scale Descriptive Statistics, Normality, and Reliability

Scale	<i>n</i>	Min	Max	Mean	SD	Skew ^a	α^b
Performance expect	377	1	5	1.86	0.78	1.183	.821
Intent to use	392	1	5	2.04	0.91	.855	.869
Satisfaction	384	1	5	2.05	0.72	.860	.812
SES growth	357	1	5	2.17	0.79	.880	.813 ^c
Social influence	375	1	5	2.29	0.87	.641	.775
Price value	383	1	5	2.42	0.95	.592	.806
Habit	389	1	5	2.42	1.02	.519	.770
Expectation confirm	392	1	5	2.52	0.88	.402	.713
Continue usage	400	1	5	2.57	0.64	.141	.339 ^d

Note. Total *n* varies because some participants did not answer all the questions

^a Skew = skewness statistic used to determine if distribution is approximately normal.

^b α = coefficient alpha for reliability.

^c α decreases to .803 when Items #48 and #49 are eliminated.

^d α increases to .621 when Item #33 is eliminated.

interpretability of the EFA solution led to the removal of five items on the basis of poor factor loadings and problematic crossloadings. This resulted in the complete elimination of the expectation confirmation variable.

The research tested the fit of the resulting model using confirmatory factor analysis (CFA). Figure 2 presents the CFA model. Model fit statistics were in the range of acceptability after employing co-variances on intrafactor error terms, as suggested by modification indices. The model fit statistics were as follows: $\chi^2 = 742.042$; $df = 308$; IFI = 0.904; CFI = 0.903; RMSEA = 0.057. These are within or close to acceptability thresholds [26]. Therefore, the model is considered to be a good fit for the data and proceeded with hypothesis testing. All standardized regression weights for the paths of interest to the study hypotheses were large and significant, indicating significant positive relationships between the variables before considering moderators. See Table 4 for the CFA regression weights.

B. Hypothesis Testing

Among both urban and rural responders, there was a significant, positive relationship between performance expectancy and intention to use. This indicates that, as performance expectancy increases, intention to use also increases. Results of the z test ($z = 2.89$, $p = 0.002$) indicated that the relationship between performance expectancy and intention to use was significantly different for rural adopters ($r = 0.37$) and urban adopters ($r = 0.60$). Therefore, **H1a and H1b are accepted** (see Table 11).

Among both urban and rural responders, there was a significant, positive relationship between social influence and intention to use. This indicates that, as social influence increases, intention to use also increases. Results of the z test ($z = 1.02$, $p = 0.154$) indicated that the

relationship between social influence and intention to use was not significantly different for rural adopters ($r = 0.36$) and urban adopters ($r = 0.45$). Therefore, **H2a is accepted**, but **H2b is rejected**.

Both urban and rural responders demonstrated a significant, positive relationship between price value and intention to use. This indicates that, as price value increases, intention to use also increases. Results of the z test ($z = 0.77$, $p = 0.221$) showed that the relationship between price value and intention to use was not significantly different for rural adopters ($r = 0.33$) and urban adopters ($r = 0.40$). Therefore, **H3a is accepted**, but **H3b is rejected**.

Among both urban and rural responders, there was a significant, positive relationship between habit and intention to use. This indicates that, as habit increases, intention to use also increases. Results of the z test ($z = 0.53$, $p = 0.298$) showed that the relationship between habit and intention to use not significantly different for rural adopters ($r = 0.52$) and urban adopters ($r = 0.56$). Therefore, **H4a is accepted**, but **H4b is rejected**. Table 5 summarizes the results for H1–H4.

I observed a significant, positive relationship between intention to use and continued usage ($\beta = 0.761$, $p < 0.001$). This indicates that, as intention to use increases, continued usage also increases. Therefore, **H5 is accepted**. Results of the z test ($z = 0.64$, $p = 0.261$) showed that the relationship between satisfaction and continued usage was not significantly different for rural adopters ($r = 0.31$) and urban adopters ($r = 0.31$). Therefore, **H6a is accepted**, but **H6b is rejected**.

Among both urban and rural responders, there was a significant, positive relationship between socioeconomic growth and continued usage. This indicates that, as socioeconomic growth

Table 3: Exploratory Factor Analysis Solution

Factor	Items	Initial Eigenvalues		
		Total	% of Variance	Cumulative %
1	38 - 43	9.870	29.908	29.908
2	17 - 20	2.272	6.884	36.793
3	44-47	2.143	6.493	43.286
4	30-32	1.915	5.804	49.090
5	24-26, 37	1.547	4.689	53.779
6	21-23	1.347	4.081	57.860
7	27-29	1.206	3.655	61.515
8	34-36	1.063	3.221	64.735
9	33, 48-49	.950	2.878	67.613

Table 4: Standardized Regression Weights

Hy ^a	Dependent Variable	Independent Variable	Estimate	<i>p</i>
1	Perf Expectancy	Behavioral intention	.690	***
2	Social influence	Behavioral intention	.539	***
3	Price value	Behavioral intention	.552	***
4	Habit	Behavioral intention	.716	***
5	Continued use	Behavioral intention	.761	***
6	Satisfaction	Continued use	.838	***
7	SES growth	Continued use	.697	***

^a Hypothesis numbers*** $p < .001$ **Table 5: Correlations of Intent to Use with Predictors Variables by Location**

Predictor	H	Supported?	Rural	Urban	<i>z</i>	<i>p</i>
Performance Expectancy	1b	Yes	.37	.60	2.89	.002
Social Influence	2b	No	.36	.45	1.02	.154
Price Value	3b	No	.33	.40	0.77	.221
Habit	4b	No	.52	.56	0.53	.298

Table 6: Correlations of Continued Usages with Socioeconomic Growth and Satisfaction by Location

Predictor	H	Supported?	Rural	Urban	<i>z</i>	<i>p</i>
Satisfaction	6b	No	.31	.37	.64	.261
Socioeconomic Growth	7b	No	.05	.18	1.25	.106

increases, continued usage also increases. Results of the z test ($z = 1.25$, $p = 0.106$) showed that the relationship between socioeconomic growth and continued usage was not significantly different for rural adopters ($r = 0.05$) and urban adopters ($r = 0.18$). For this reason, **H7a** is **accepted**, but **H7b** is **rejected**. The results for H6 and H7 are summarized in Table 6.

c. Discussion

Results revealed that urban and rural smartphone users differed significantly with respect to only one of the relationships tested: that between, Performance Expectancy and Intention to Use smartphones. Performance Expectancy refers to the degree to which users believe that using technologies (in this case, Internet-enabled devices like smartphones) will improve their performance. Therefore, this result indicates that urban dwellers who believe smartphones will improve their lives subsequently intend to use their smartphones more often than rural dwellers with the same level of performance expectancy. Venkatesh *et al.* [27] argued that users will consider performance expectancy in making decisions about whether to use technologies, and the finding of this study, regardless of user locale, supports this argument.

Regarding the moderating effect of locale, there are several possible explanations for this finding. Apulu *et al.* [28] argued that diffusion of mobile technology was happening rapidly in African cities, but it was extended to rural areas only because of the need to expand the customer base. This could suggest that there is less demand for smartphones overall among rural Nigerians than among their urban-dwelling counterparts. However, if this were the case, one would expect there to be a significant moderating effect from locale with respect to

other relationships, which the results of this study did not reveal. Therefore, another explanation is needed.

5. CONCLUSION AND RECOMMENDATION FOR FURTHER WORKS

Several research teams focusing on African nations have stressed the importance of existing social structures in determining usage patterns for communication technologies [29-31]. In particular, Carmody argued that technology is embedded in existing social relations of support, resource extraction, and conflict. This suggests that, even if rural dwellers perceive that mobile technologies could be useful in enhancing their performance, their intent to use such technologies could fail to increase accordingly if the social structures in place for smartphone use are not as developed as in urban areas. Conversely, the relationship could be stronger among urban dwellers because social and cultural norms are more favorable toward smartphone use.

Indeed, among both urban and rural responders in this study, social influence was positively correlated with intention to use smartphones. Thus, the results suggest the hypothesis that, independent of satisfaction of expectations, social structures and norms influence continued usage. Therefore, performance expectancy as a predictor of intention to use technologies and continuous usage should be considered as a context-dependent variable.

The study also revealed that intention to use and continued usage are strongly positively correlated. This sheds light on the usefulness of studying intent to use as a measure of the success of smartphones and other technologies. Bhattacharjee [32] argued that continuous usage is more important for studying innovations than intent to use. However, this study demonstrates that the two variables are closely

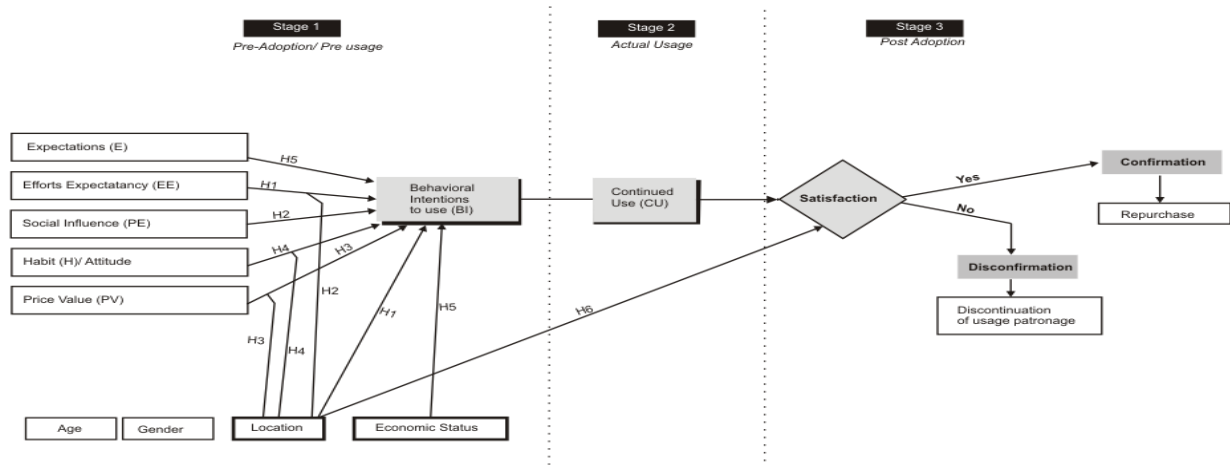


Figure 1: Theoretical model of continued use and satisfaction with smartphones among urban and rural Nigerians.

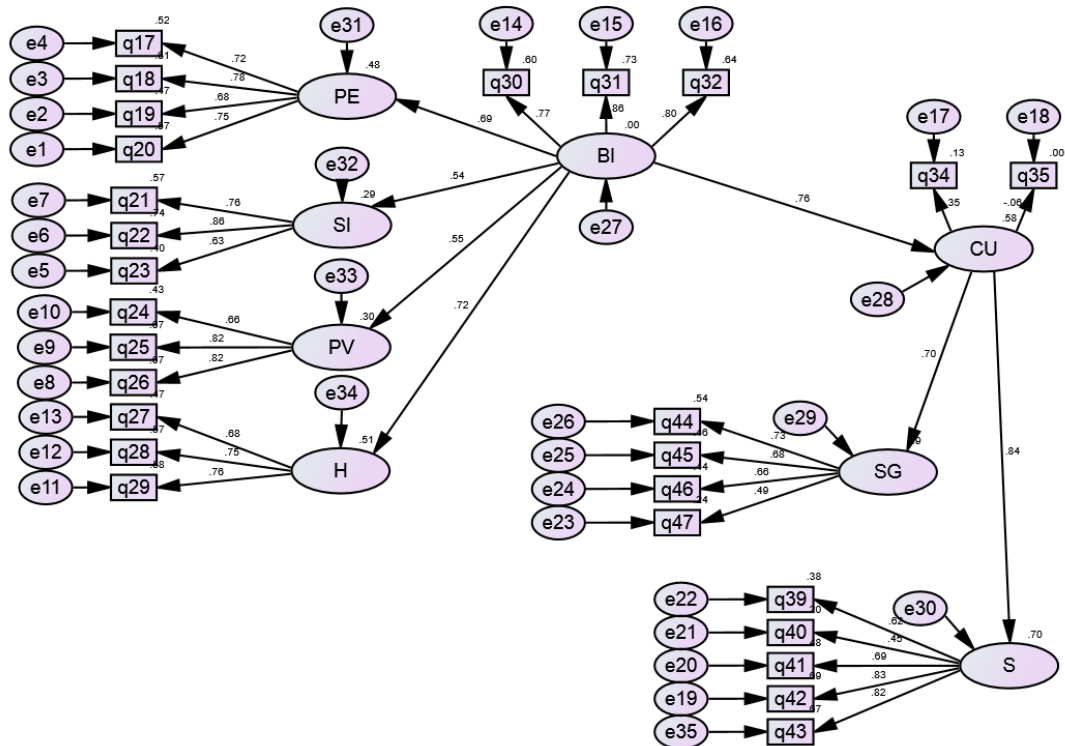


Figure 2: Quantitative Model of Smartphone Adoption Among Urban and Rural Nigerians

Variables labeled q with a number (q1, q2, etc.) are the questions on the survey. Latent variables are PE = Performance Expectancy, SI = Social Influence, PV = Price Value, H = Habit, BI = Behavioral Intention to Use, CU = Continued Usage of Smartphone, SG = Socio-economic Growth, S = Satisfaction.

related, indicating that it remains appropriate to study intent to use as a measure of the success of technology products.

This study is subject to certain limitations, and any interpretation of the findings should take the limitations into account. First, the cross-sectional approach made it impossible to assess participants' behaviors over time. This limitation is to some extent ameliorated by the inclusion of both initial and continuous intent to use measures. However, actual use and continuous use over time cannot be assessed using the data collected for this study. Secondly, owing to cultural and economic differences, the results of this study are not generalizable beyond the region of sub-Saharan Africa, and the results may not be relevant to smartphone users outside that region.

This work recommend further research to be implemented on how to better understand the influence of social factors on performance expectancy in developing nations vis-à-vis low-end phones and high-end phones. Also, longitudinal studies would be required to empirically confirm any conclusions regarding long-term smartphone use and other behaviors.

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