

Socio-Technological Factors Influencing the Use of GSM in Communication and Sustainable Development in Nigeria

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Abstract—The study investigates the influence of social and technological problems/factors and the use of GSM in communication towards ensuring sustainable development in Nigeria. The multi-stage sampling technique is used for this study. The local governments are divided into two major strata, and from each stratum, one local government is selected randomly. From the Ibadan-less city, Akinyele local government is selected, and from Ibadan urban, it is Ibadan North East. Also, since the population of GSM users are unknown, a convenient sampling technique is deployed to select 200 respondents. The result reveals that although GSM users are satisfied with the reliability of the communication by mobile phones, some problems exist. Those problems are network issues, inability to perceive what the person at the other end is doing, and mistrust and distrust among speakers. Those problems have affected the satisfaction and use of GSM. In addition, some personal, social, and technological factors influence the efficient and non-efficient use of GSM ($p < 0.05$). As a result, users deploy various strategies to ameliorate these problems. Finally, GSM use among mobile users has a significant effect on users development ($p < 0.05$), which can be personal or communal. It is recommended that telecommunication should upgrade the system to encourage good interpersonal communication among GSM users and also consider some personal and social factors to enhance the efficiency use of GSM that will have sustainable impact on lives.

Index Terms—GSM Use, Social Factors, Technological Factors, Mobile Phone Use, Sustainable Development

I. INTRODUCTION

SCIENCE and technology have continued to develop discoveries and innovations that can affect the lives of the global population. It is pertinent to note that these discoveries and innovations are sine qua non for development that may include individual, communal, sectoral, national, and also global level. One of the innovations and developments is the Information and Communications Technologies (ICTs). ICT, especially

the telecommunications technologies (GSMs, cable, satellite, and radio) and digital technologies (computers, information networks, and software) have become increasingly powerful tools for development [1]. The Global System of Mobile Communications popularly known as GSM is another example and a major ICT that has affected the development. At first, when GSM came, it was only for the rich and wealthy people and for the well developed areas and for big organizations (with a high elasticity of digital divide). Today, this has drastically changed. Nevertheless, studies still reveal the existence of digital divide that needs to be addressed [2, 3].

GSM has totally changed the social order of nations and encouraged economic growth. GSM is a popular ICT and a popular means of communication in both developed and developing countries such as Nigeria, and widely used among the poor and rich, privileged and non-privileged people. The use of GSM such as mobile phone has become widespread all over the world. Many people including the rich and poor are mobile-phone owners and subscribers [4]. The use of GSM such as mobile phones is a common property resource as seen in most sub-Saharan Africa like Nigeria. One of the major roles of GSM as the mobile phone is aiding communication irrespective to the location or parties involved. Reference [5] reveals that mobile phone has been the most useful medium for communication among users in Nigeria.

Communication is the process of transmitting information and common understanding from one person to another [6]. It can be understood using a very simple model where the speaker or writer or signer sends a message (text, voice, and video) through a particular medium which may or may not be received and interpreted correctly. Usually, it is a two-way process between the sender and the receiver. The sender sends a message, and the receiver receives it and becomes the sender when the first individual that sends the message

becomes the receiver and this goes on vice versa until their purpose for communication is achieved. This implies that the sender and receiver switch tasks, and round and round it goes. The medium may include a paper. If it is on the phone, it uses the telephone wires.

The use of GSM for communication has become integral part of users activities in their daily lives. Most people use their mobile phone for social contact to communicate with people. Generally, it can be said that the GSM appears differently from the other computational device that people have a unique attachment to them. They are associated strongly with social and close family contact that is maintained through the device [7]. Other factors that may influence its use in communication are level of education, income, social network, and membership of groups [8]. Furthermore, studies have shown that the use of GSM in communication could affect growth of livelihood, business enterprises, and others [5, 9].

Many developing countries such as Nigeria have poor communications infrastructure, high rate of poverty, high unemployment, and others that prevent the use of GSMs and connectivity, particularly in rural areas [3]. Even in the urban areas, sometimes these setbacks are felt by the users of GSM due to network congestion and lack of ability for the telecommunication industry to provide services that will meet up with the increase in population of the nation. The issue of infrastructure is also important as this requires global and long-term investment, and support from variety of sources including governments, private sector, multi-lateral institutions (United Nations), financial institutions (World Bank), and the civil sector (NGOs) [3]. Other factors that may influence the use of GSM for communication are personal, social, and environmental [10, 11]. These factors may hinder the benefits that GSM could bring to development. Therefore, there is a dire need to examine these factors and how they can affect the use of GSM among users. If the quest is not determined, it is pertinent to draw attention to the fact that the development obtained may be temporary and may not be sustainable.

Sustainable development has been approached from developed direction especially when it is considered in a multidisciplinary setting. Reference [12] sees it as a development that lasts and does not crumble in the face of formidable problems. In addition, Ref. [13] defines it as a development that does not roll back or recede, even in the threatening reversal waves. Merging the definition of Refs. [12] and [13], the problems and threats may include the personal, social, and technological. Furthermore, measuring development has also attracted much debate. Nevertheless, the indices for measuring sustainable development are quality of

life, electricity price, call completion rate, line losses, affordability of technology, literacy level, employment, and others [14].

This present study seeks to address the influence social and technological problems/factors that could inhibit the use of GSM in communication. The strategies deployed by users to ameliorate these problems in Nigeria can enjoy the benefits that the GSM brings and also ensuring sustainable development for users. The following research questions would be used for the study:

- i Do users of GSM in Nigeria have effective communication process?
- ii What are the socio-personal factor(s) responsible for effective or non-effective use of GSM for communication?
- iii What are the technological factors responsible for effective or non-effective use of GSM for communication?
- iv What strategies are deployed among users to maximize the use of GSM for communication in encountering these problems?
- v Are users satisfied when they deploy those strategies?
- vi Are there significant influences the use of GSM to development (personal and community) and is such development sustainable?

II. LITERATURE REVIEW

Studies have shown a number of factors that hinder the use of ICT such as GSM/mobile phone in communication in developing countries such as Nigeria. This has resulted in digital divide syndrome. According to Ref. [15], a major factor that influences the use of ICT such as mobile phone is the technology related problem. There is also access problem [16] due to financial constraint which could be due to high elasticity rate of poverty and unemployment in Nigeria. Furthermore, other factors include technological problem [3], and personal, social and environmental factors [10, 11]. Reference [17] has stated that youths are phone crazy, and more than 90 percent of uncertified artisans carry phones. Because of interest and frequency of use, they acquire the skill to manipulate the handset for calls and minor operations. Yet, the phone is underutilized.

A study by Ref. [18] reveals that the state of infrastructures, especially telecommunications infrastructure poses a major hindrance to the use of ICT such as mobile phone in Nigeria with Nigeria having one of the lowest tele-density in sub-Saharan Africa even though the rate has increased exponentially between 2002 and 2006. In addition, Ref. [16] finds that cultural barrier is a major challenge in Nigerian to adopt and use ICT

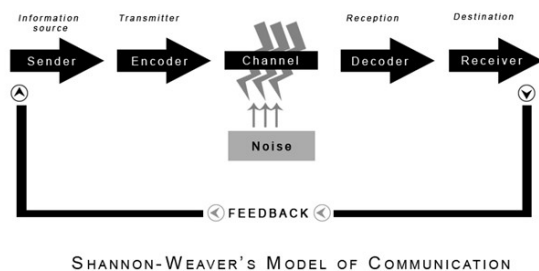


Fig. 1. The theoretical framework for the study.

such as mobile phone. The lack of policy/institutional framework in Nigeria also affects the use of ICT (GSM) [16]. Although a policy on information communication technology was formulated in 2002 by the Nigeria Information Technology Development Agency (NITDA), it has not been properly implemented. Also, there has not been a purposeful policy on ICTs such as GSM use in Nigeria [18].

This lack of framework or policy in Nigeria has made it difficult to maximize the benefits of GSM. Thus, it lags behind due to various factors. This present study provides a basis for such framework and necessary factors that may be important to formulate the policy. It is to enhance the usability of GSM among users and enjoy the benefits it brings to development by addressing those important factors.

III. RESEARCH FRAMEWORK

The study adapts the Shannon-Weaver model of communication proposed in 1948. This model is specially designed to develop effective communication between sender and receiver. In addition, it postulates that, there are some factors that may affect the communication process called “Noise”, see Fig. 1. In this present study, personal, social and technological factors can create the noise. The model deals with various concepts like information source, transmitter, noise, channel, message, receiver, channel, information destination, encode and decode.

In addition, the study adapted the community development model by Ref. [19]. This model reflects the familiar concepts of community processes, consensus building and empowerment. It is a model used in education, health, economic, development, community healing, etc. It can also be used in telecommunication. According to the World Commission on Environment and Development, sustainable development has the following nine objectives [?]. There are reviving growth; changing the quality of growth; meeting essential needs for jobs, food, energy, water, and sanitation; ensuring

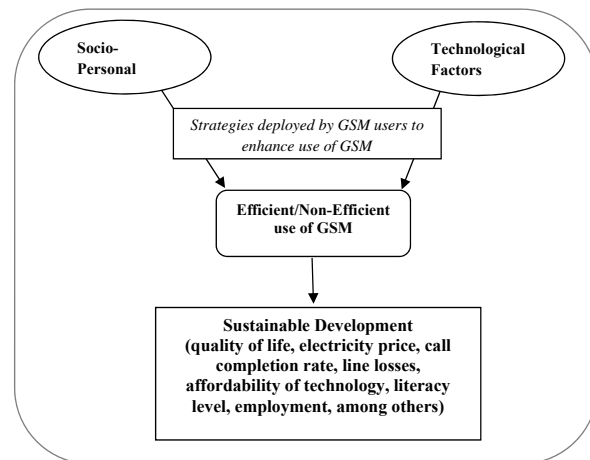


Fig. 2. A socio-technological-development model for effective GSM use.

a sustainable level of population; conserving and enhancing the resource base; reorienting technology and managing risk; merging environmental considerations and economics in decision making; reorienting international economic relations; and making development for more participatory.

In addition, Refs. [20] and [21] states that sustainable development at the local and national levels are a function of five variables. These are biophysical and socioeconomic resources; external factors such as available technologies and development ideologies; internal factors including socio-cultural belief systems and local production and technological bases; population factors; and political and economic factors. A sustainable-development strategy will take into account all of the variables and will involve working, learning, and experimenting together at the local, regional, national, and international levels [21]. The following model is used to drive this study (Fig. 2).

The socio-technological development model of GSM uses hypothesis that all things are equal, some personal, social, and technology factors may influence the efficient use of GSM which may in turn influence the use of GSM for sustainable development by users. However, due to the factors that may inhibit use, GSM users may deploy some strategies to help them tap into the benefits that GSM could bring to the development (personal and community/society).

IV. RESEARCH METHOD

The study is a correlation survey research, and the sample was drawn from Oyo State, Nigeria. Oyo State is a major State in Nigeria with Ibadan as the capital. Ibadan is the biggest city in Nigeria, which makes it a popular place for the use of GSM due to its high

population. Ibadan has eleven local government areas (Table I).

The multi-stage sampling technique is used for this study. First, the local Governments are divided into two major strata, Ibadan less and Ibadan urban city. From each stratum, one local government area is selected randomly. From the Ibadan less city, it is Akinyele local government area; and from Ibadan urban, it is Ibadan North East. Also, since the population of GSM users is unknown, a convenient sampling technique is deployed. Furthermore, 200 respondents are selected and used for this study, 100 from Akinyele local government area and 100 from Ibadan North East. Both questionnaire and interview guide are used to obtain data and information from the field. The psychometric properties of the questionnaire are determined using the Cronbach alpha and it gives a result of 0.74. Data obtained from the field are analyzed. The qualitative responses are analyzed thematically while the frequency, binary logistic, and Spearman's correlation are used for the quantitative analysis with 0.05 level of significance.

V. RESULTS AND DISCUSSIONS

The information and data obtained are used for analysis. The analysis is done regarding various themes addressing the research questions in the study.

Research Question One: Do GSM users in Nigeria have effective communication process?

Then result for the effective communication process among respondents is presented in Table II. The result in Table II reveals that 74% state that whenever they use mobile phone for communication, they are more than satisfied that their messages are gotten and understood by the receiver; 68% agree that there is often network problem which may delay communication and reduce its effectiveness. 66% state that there are some problems during communication that could frustrate one out of using mobile phones. 59% say that most times they do not hear what the other person at the other end is saying or communicating. Furthermore, 53% state that during communication, someone can lie and the others do not notice such. 50% agree that they do not trust what people say when they use mobile phone to communicate. 49% suggest that the use of mobile phone for communication is not effective at all while only 45% state that they often do not enjoy using mobile phone for communication. The result reveal that GSM users are satisfied with their communication success in the use of mobile phone in communication. However, some problems are encountered during communication such as network issues, inability to perceive what the person at the other

end is doing, mis and dis-trust among speakers, and others. In the end, GSM users do not have effective communication process in using mobile phones.

Research Question Two: What are the socio-personal factors affecting the effective/non-effective use of GSM for communication?

The classification table of the binary logistic is provided in Table III. The result in Table III shows that the prediction of the independent variables on the dependent variable would be 82.5% of accuracy. This reveals a high precision level in the logistic regression result of the relationship between the dependent and the independent variables. The logistic regression result is in Table IV.

The result in Table IV reveals that only age, years of use of mobile phones, occupation of GSM users, and social factors are significant ($p < 0.05$). In addition, age which includes GSM users below 25 years ($p < 0.05$), between the age brackets of 26-30 years ($p < 0.05$) are accountable for the effective use of GSM for communication among users. Years of experience (below 5 years specifically) accounts for ineffective use of GSM for communication process. Also, occupation of GSM users (precisely those who are civil servants) is significant ($p < 0.05$) accounting for the effective use of GSM for communication among users. Social factors is also significant ($p < 0.05$) accounting for the effective use of GSM for communication among users. Other variables are not significant ($p > 0.05$). This implies that GSM users below the age of 30 years have more effective use of mobile phones in communication process than those above 30 years.

Those who have lesser than 5 years experience in the use of GSM do not have effective communication in the use of GSM. GSM users who are civil servants are more effective in using mobile phones for communication. In addition, GSM users who are more social communicate effectively with the use of mobile phones than others who are less social. This implies that for GSM user to use mobile phone effectively in communication, such users should be social. For example, the responses from the interview provide some social issues that could affect the use of GSM in communication among users. A young respondent, during the interview states that:

'Using the networking sites, you meet people of different calibers, and you are basically exposed to them and your relationship circle increases especially through networking sites, among others, you can easily get influenced and this could affect communication.'

Another respondent states that:

TABLE I
POPULATION OF IBADAN CITY.

No.	Local Government	Population		Increment (%)	Annual Growth Rate (%)
		1991	2006		
Ibadan Less City					
1	Akinyele	140 118	211 359	50.8	2.8
2	Egbeda	129 461	281 573	117.5	5.3
3	Ido	53 582	103 261	92.7	4.5
4	Lagelu	68 901	147 957	114.7	5.2
5	Ona-Ara	123 048	202 725	121.5	5.4
6	Oluyole	91 527	265 059	115.4	5.3
Ibadan Urban					
1	Ibadan North	302 271	306 795	1.5	0.1
2	Ibadan North East	275 627	330 399	19.9	1.2
3	Ibadan North West	147 918	152 834	3.3	0.2
4	Ibadan South East	225 800	266 046	17.8	1.1
5	Ibadan South West	227 047	282 585	2.0	0.1

TABLE II
DISTRIBUTION OF THE EFFECTIVENESS OF COMMUNICATION PROCESS AMONG GSM USERS IN NIGERIA.

Items for Communication Process	Frequency	Percent
Most Often, I don't enjoy using mobile phone for communication		
<input type="checkbox"/> Disagreed	104	52.0
<input type="checkbox"/> Agreed	90	45.0
<input type="checkbox"/> Missing Values	6	3.0
Most times we do not hear what we are trying to communicate		
<input type="checkbox"/> Disagreed	83	42.0
<input type="checkbox"/> Agreed	117	58.0
During communication, someone can lie and you won't be able to notice such		
<input type="checkbox"/> Disagreed	94	47.0
<input type="checkbox"/> Agreed	105	52.5
<input type="checkbox"/> Missing Values	1	0.5
I don't trust what people say when they use mobile phone to communicate		
<input type="checkbox"/> Disagreed	98	49.0
<input type="checkbox"/> Agreed	100	50.0
<input type="checkbox"/> Missing Values	2	1.0
Whenever I use mobile phone for communication, I am more than satisfied that my message is gotten and understood by the receiver		
<input type="checkbox"/> Disagreed	51	25.0
<input type="checkbox"/> Agreed	148	74.0
<input type="checkbox"/> Missing Values	1	0.5
There are sometimes problems during communication that could frustrate one out of using mobile phones		
<input type="checkbox"/> Disagreed	64	32.0
<input type="checkbox"/> Agreed	132	66.0
<input type="checkbox"/> Missing Values	4	2.0
The use of mobile phone for communication is not effective at all		
<input type="checkbox"/> Disagreed	93	46.5
<input type="checkbox"/> Agreed	98	49.0
<input type="checkbox"/> Missing Values	9	4.5
Most often, there is network problem which may delay communication and reduce its effectiveness		
<input type="checkbox"/> Disagreed	63	31.5
<input type="checkbox"/> Agreed	136	68.0
<input type="checkbox"/> Missing Values	1	0.5

TABLE III
CLASSIFICATION TABLE OF RESEARCH QUESTION TWO
REGARDING THE COMMUNICATION PROCESS.

	Predicted		Corret (%)
	1	2	
Observed	1	24	58.5
	2	7	92.7
Total			82.5

'When you are calling someone, and another person is shouting beside you or you are in a noising environment, you may not hear what the person on the phone is communicating.'

Furthermore, an older respondent states that:

'There is no security when it comes to using the GSM through the internet. There are some information you try to get and they will take you to some private unknown where someone will end up hacking your account and getting the information that are supposed to be private.'

Research question three: What are the technological factors affecting the effective use of GSM for Communication?

The classification table for the binary logistic result for technological factors and communication process is presented in Table V. The result in Table V shows that the prediction of the independent variables on the dependent variable would be 75.1% of accuracy. This reveals a high precision level in the logistic regression result of the relationship between the dependent and the independent variables. The logistic regression result is given in Table VI.

The result of the binary logistic reveals that only infrastructural problem, technological imbalance, government problems, and fake products are significant ($p < 0.05$). Other variables are not significant ($p > 0.05$). Infrastructural problem is observed by considering the use of GSM for effective communication. Meanwhile, technological imbalance, government problems and, fake products account for the non-effective use of GSM in communication. This implies that the technological imbalance, government problems and, fake products have made users of GSM not enjoy the benefits in the use of GSM for effective communication. For the infrastructural problem, users still had effective communication process. This could be because users have deployed several strategies to make sure their use of GSM for effective communication is not hindered via the absence of infrastructure. Hence, GSM users deploy several methods.

In addition, the interview responses provide series of technological problem militating against the effective use of GSM in communication. These include network failures, epileptic power supply, inferior materials to make phones, fake SIMs, high rate of subscription, high cost of charges and data bundle, bad connectivity, low downloading potentials, cybercrime (someone may call and tell you that you have won a prize you never apply for), fake promo from both the telecommunication and external individuals using network numbers and providing mis-leading information to customers by telecom leading to un-necessary deduction of money from customers, non-reliance of information provided by telecom, lack of easy access to customer care, and bad queuing model deployed in customer centres as one may have to wait for a long time to get responses. Others include language of communication is not meeting the illiterate population, and messages sent by telecoms do not have targeted audiences as they send messages without knowing the interests and preferences of customers.

Research question four: What are the strategies deployed among users to maximize the use of GSM for communication in encountering these problems?

Strategies deployed by GSM users are different especially when one considers the stochastic pattern of the problems. Responses from the interview schedule revealed that:

- i For network failures, users keep trying until call or SMS goes through.
- ii For epileptic power supply, users use generator, external charging devices, or in some cases use solar means to charge the battery. User can also have two to three or more batteries to alternate when it runs down until favourable condition to charge comes.
- iii For the inferior materials, user has to be careful and there is also need for patience when looking for original products.
- iv For fake SIMs, user should not buy SIM card anywhere. Regarding this, a respondent states that:

'When I need a SIM, I go to the network office to buy one. In such way, I will reduce the tendency of getting a fake SIM.'
- v For Cybercrimes, user needs to be careful and not to jump at offers. A respondent states that:

'If such kind of thing occurs, I call the customer care to get more information about what such crime source offer. Usually when I do that, I am told that such kind of offer never existed on the network. Howbeit, they never asked for the number or the identity of such

TABLE IV
LOGISTIC REGRESSION RESULTS.

Variables of Study	B	S.E.	Wald	df	Sig.	Exp(B)
Gender (ref cat= Male)	-0.390	0.568	0.471	1	0.493	0.677
Female						
Age (year) ref cat= above 51			7.255	5	0.202	
< 25	2.556	0.984	6.752	1	0.009	12.890
26–30	2.400	1.087	4.875	1	0.027	11.019
31–35	1.861	0.977	3.629	1	0.057	6.430
36–40	1.205	1.25	0.931	1	0.335	3.338
41–50	22.597	12233.131	0.000	1	0.999	6.520E+09
Academic Qualification (ref cat= Others)			3.243	4	0.518	
No formal Education	0.184	2.198	0.007	1	0.933	1.202
Primary Education	-1.358	2.096	0.42	1	0.517	0.257
Secondary Education	-0.751	2.037	0.136	1	0.712	0.472
Tertiary Education	-0.391	2.143	0.033	1	0.855	0.676
Years of use of Mobile Phone (ref cat= Above 10 years)			6.048	2	0.049	
< 5	-3.383	1.405	5.800	1	0.016	0.034
6–10	-0.528	0.628	0.709	1	0.4	0.590
Religion (ref cat= None)			2.280	3	0.516	
Christianity	-19.438	20517.153	0.000	1	0.999	0.000
Islam	-20.876	20517.153	0.000	1	0.999	0.000
Others	-20.087	20517.153	0.000	1	0.999	0.000
Marital Status (ref cat= Others)			1.958	4	0.744	
Married	1.465	2.087	0.493	1	0.483	4.326
Single	1.770	1.804	0.963	1	0.326	2.21E+09
Widow	2.974	2.159	1.896	1	0.168	19.565
Occupation (ref cat= private firm employee)			6.98	4	0.137	
Civil Servant	1.617	0.727	4.948	1	0.026	5.040
Entrepreneur	0.740	0.848	0.761	1	0.383	2.096
Unemployed	1.750	1.061	2.718	1	0.099	5.752
Banker	0.381	0.763	0.249	1	0.618	1.463
Social Factors	0.262	0.107	6.047	1	0.014	1.300
Constant	14.082	20517.153	0.000	1	0.999	1305170.52

TABLE V
CLASSIFICATION TABLE FOR BINARY LOGISTIC RESULT FOR RESEARCH QUESTION THREE.

	Predicted		Corret (%)
	1	2	
Observed	1	35	56.5
	2	17	85.2
Total			75.1

source. I think they may continue with that and others who are ignorant may fall victim of their pranks.'

- vi For unnecessary deduction of money, a respondent states that:

'I think it is the government that should handle that. Nevertheless, what I do in such occasion, since the cost of obtaining a line is quite cheap, I inter-switch from one network to another to get the cheapest network to maintain.'

- vii For non-relevance of information, a respondent states that:

'SMS sent to me that are not reliable are deleted, it just need my time to separate those useless message and delete them of my phone.'

- viii For the queuing model, another respondent states that:

'I just have to wait until my turn comes or I call back when I know I am less busy.'

Research question five: Are users satisfied in deploying those strategies to solve communication problems?

Responses on the satisfaction obtained from the strategies deployed by users are also derived. It is revealed that users are not really satisfied with these strategies deployed. Nevertheless, they use them to ameliorate the effect of these problems on their GSM use for communication.

Research question six: Are there significant influences the use of GSM brings to development (personal and community), and is such development sustainable?

The result for the use of GSM and sustainable development is analyzed using a Spearman correlation analysis due to the non-probabilistic method of data collection or respondents selection.

The result in Table VII reveals that the r -value is 0.265, with a p -value of 0.000. This implies that GSM use by mobile users has significant effect on users development ($p < 0.05$). Therefore, the use of GSM

TABLE VI
BINARY LOGISTIC RESULTS FOR RESEARCH QUESTION THREE.

	<i>B</i>	S.E.	Wald	Df	Sig.	Exp(<i>B</i>)
Infrastructural Problem (Ref Cat= Disagreed)						
Agreed	0.990	0.416	5.676	1	0.017	2.692
Technology Cost of use (Ref Cat= Disagreed)						
Agreed	-0.215	0.409	0.276	1	0.600	0.807
User Problem (Ref Cat= Disagreed)						
Agreed	-0.040	0.375	0.011	1	0.915	0.961
Bad customer orientation (Ref Cat= Disagreed)						
Agreed	-0.632	0.392	2.600	1	0.107	0.531
Telecommunication Problem (Ref Cat= Disagreed)						
Agreed	-1.319	0.399	10.937	1	0.001	0.267
Technological imbalance (Ref Cat= Disagreed)						
Agreed	-0.755	0.435	3.012	1	0.083	0.47
Government Problem (Ref Cat= Disagreed)						
Agreed	-1.615	0.440	13.452	1	0.000	0.199
Fake products (Ref Cat= Disagreed)						
Agreed	-1.457	0.419	12.106	1	0.001	0.233
Constant	2.578	0.617	17.446	1	0.000	13.166

TABLE VII
CORRELATION ANALYSIS RESULT.

	<i>N</i>	Mean	Std.	<i>r</i> -value	<i>p</i> -value
GSM in comm.	195	12.3	2.0	0.265	0
Sustainable Dev.	178	26.5	4.6		
Valid N (listwise)	173				

in communication among users can bring significant development to users which could include personal and communal environment such as religious settings, businesses, and others. This is further corroborated by the interview responses. The result from the interview schedule reveals that the use of GSM in communication is as follows:

- i It enhances users information awareness on certain issues such as health tips, education for children, politics national development information, nursing mothers, fertility issues, etc.
- ii Although, it is also a major source for information for businesses however, such opportunities cannot be accessed for profit.
- iii It is used to send messages and communicate with students in the academic and business sector especially at the tertiary level
- iv It is used as source of political campaign.
- v Churches also use it as source of advert and to reach their members.
- vi It is used to call people when in dire need. For example one respondent to this end stated that:

‘One day, my sister was kidnapped and she could not call so all she was able to do was send an SMS to me. I called other members of the family and we prayed. To be brief, she latter escaped from the kidnappers, the reason

I cannot tell. Perhaps God heard our prayers. Such kind of communication would not have been made possible without the GSM, or if there is network problem or if there is no network in that location where she was taken to.’

- vii Organizations use it as a source for recruiting employees,
- viii Other individuals use it as source of livelihood to feed their families, among others.

A. Findings

The result of this study reveals that the use of GSM for communication makes users satisfied that their messages are received and understood by the receiver. However, network problems may delay such communication and reduce its effectiveness. Other problems during communication that could frustrate users in using mobile phones includes not being able to hear what the other person at the other end is saying or communicating, someone who is lying and users will not be able to notice, which could lead to not trust what people say when they use mobile phones to communicate. These problems have made it impossible to achieve effective communication in the use of mobile phones among GSM users. Furthermore, GSM users below the age of 30 years-old have more effective use of mobile phones in communication process than those above 30 years-old. Those who have less than 5 years experience in the use of GSM do not have effective communication in the use of GSM. This confirms the work of Ref. [17] saying that youths are addicted to phones. Because of their interest and frequency of use, they acquire the skill to manipulate the handset for

calls and minor operations, which shows that those above 30 years-old may not use their phone frequently.

GSM users who are civil servants are more effective in their use of mobile phones for communication. However, this is different from the study of Ref. [17] that more than 90% of uncertified artisans, which in this study includes self-employed GSM users carry phones. Although, they may carry mobile phones, they do not put it into effective use like the civil servants do. In addition, GSM users who are more social, communicate effectively in the use of mobile phones than others who are less social. This implies that for GSM user to use mobile phone effectively in communicating, such user should be social. For example, using the networking sites, people meet different calibers, exposure through friends in the use of GSM. Also, interference of noise when making a phone call, lack of privacy, and security issues in the use of the internet on mobile application may lead to be hacked and get your private information stolen. These may interfere in the effective use of GSM. The result of this study supports the results of Refs. [2, 3, 17] that some levels of digital divide in Nigeria still exists, especially in the use of ICT for communication such as mobile phones. In addition, the result of this study concurs with Refs. [7] and [8] theories, saying that the use of GSM among users are associated strongly with social and close family contact that are maintained through the device. Also, this study supported the work of Ref. [10] and Ref. [11] that personal and social factors affect the effective use of GSM for communication among users.

VI. CONCLUSIONS

The technological imbalance, government problems, and fake products have made users of GSM do not enjoy the benefits in the use of GSM for effective communication. Notwithstanding the infrastructural problem as affirmed by Ref. [18], users still communicate effectively because users have deployed several strategies to make sure their use of GSM for effective communication is not hindered via the absence of infrastructure. GSM users deploy several methods. Furthermore, this study helps resounds the work of Ref. [5] that despite the infrastructural problem and high poverty level as stated by the Ref. [3], GSM users still use mobile phones because it is the most useful tool for communicating among users in Nigeria.

Technological problem militating against the use of GSM for effective communication are network failures, epileptic power supply, using inferior materials to produce phones, fake SIMs, high rate of subscription, high cost of charges and data bundle, bad connectivity, low

downloading potentials, cybercrime (someone may call and tell you that you have won a prize you never apply for), fake promo from both the telecommunication and external individuals sometimes using network numbers, providing misleading information to customers by telecom, leading to unnecessary deduction of money from customers, non-reliance of information provided by telecom, lack of easy access to customer care and bad queuing model deployed in customer centres as one may have to wait for a long time to get a response. Others include language of communication does not meet the illiterate population, and messages sent by telecoms do not have targeted audiences as they send messages without knowing the interests and preferences of customers.

Strategies deployed by GSM users are different by considering the stochastic pattern of the problems. Although GSM users deployed many strategies to curtail or ameliorate the problems militating their effective use of the GSM in communication, they are not really satisfied with these strategies. Nevertheless, they use them to ameliorate the effect of these problems on their GSM use for communication. The use of GSM in communication among users has brought significant effect on development of users which include personal and communal environment such as in religious settings, businesses, and others. Moreover, the use of GSM for communication has enhanced users information awareness on certain issues such as health tips, education for children, politics national development information, nursing mothers, fertility issues, etc. It is also a major source for information for businesses. Even though such opportunities have not been able to be accessed for profit, it has also been used to send messages to students in academic sector, especially at the tertiary level to call people when in dire need. It is also used as a source of political campaign; churches also use it as a source of advert and to reach their members. It is a source for recruiting employees by organizations, and other individuals use it as a source of livelihood to feed their families. This bolstered Abdulwahab and Umma (n.d.) theories, saying that ICT, especially the telecommunications technologies (GSMs, cable, satellite and radio), as well as digital technologies (computers, information networks and software) have become increasingly powerful tools for development. Furthermore, the results of this study concurs with Refs. [5] and [9] that the use of GSM in communication could affect the growth of livelihood, business enterprises, and others.

A. Recommendations

From the study, various recommendations could be drawn. These are as follows:

- i Telecommunication should upgrade their system to encourage good interpersonal communication among GSM users,
- ii Users should be encouraged to use video communication strategy so that they can see the person they are communicating with. However, the strategy should be provided to users at low cost and should be easy to use,
- iii Mobile applications and systems that are age specific should be introduced so that youths and adults can also have a choice to either select from such systems and applications or not,
- iv Mobile applications and systems that should address specific occupations such as business men/women, civil servants, bankers, among others should also be introduced so as to give room for preferential choice with regards to occupation. In some occasions, telecommunications should collaborate with some specific government parastatals, and occupations such as banking sector to provide some necessary services to their staff and even clients in a subsidized rate to encourage its use and its means for communication.
- v Some social factors should be put into considerations such as educational level, institutions, religion/churches/mosques, among others. To this effect, telecoms can reach to their clients in these various social places because there is a wide network of relations. In such places, discount can be provided to students via the Student Union Government, the director/vice counselor, among others where students can have access to good phones that can enhance interpersonal communication. Also, this can be a major means for the use of lecture by the institution/department. The same can be deployed in other occupational status,
- vi Telecoms should give attention to the issue of privacy especially in networking sites and developing countries such as Nigeria
- vii The government should pay attention to the provision of infrastructure to enhance the use of GSM and other ICT devices in Nigeria so that they can tap into the benefits that it brings to development which includes personal, community, and national,
- viii Telecoms should make sure attention is drawn to the issue of fake SIMs and fake GSM products to enhance the use of GSM in communication among users,
- ix In addition, attention should also be drawn by telecom and other legal bodies in Nigeria to punish all cybercrimes in Nigeria to reduce its level and thus give room for justice in the use of GSM among users.
- x Telecoms industry should provide a way or strategy to empower individual through GSM use to have impact on livelihood and create sustainable development on GSM users. This may be through offering/providing grants and financial support to business/SMEs/small business.
- xi Telecoms can also provide mentorship and monitoring to business especially new and inexperienced business/SMEs to enhance their performance.

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