

# FACTORS INFLUENCING THE ADOPTION OF MOBILE TELEPHONY BY STUDENTS AT THE UNIVERSITY OF IBADAN, NIGERIA

*Williams Nwagwu*

*Sunday Odetumibi*

University of Ibadan, Nigeria.

## ABSTRACT

*This paper deployed Roger's innovation adoption theory to explain the penetration of mobile technology in Nigeria's premier higher educational institution, the University of Ibadan, using data collected from 370 students. Technological characteristics such as relative advantage, complexity, trialability and compatibility explained adoption. Age is negatively and significantly related to adoption, and enrollees for the PhD. programme appear to be less intensive adopters of mobile phones than those in the master's and bachelor's degree programmes. Except for interpersonal relationship, all psychological variables, perceived popularity, perceived need and mass media use have a significant relationship with adoption of the technology. This study is limited to respondents selected from one university using a questionnaire. Apart from providing policy information to the university which is currently implementing mobile learning systems, the results of the study may provide useful information to telecom companies on how to target student communities in designing and packaging their products and services.*

**Keywords: adoption, mobile telephony, University of Ibadan, Nigeria**

## Background

With more than five billion GSM subscribers around the world in 2010 (MobiThinking, 2010), the rapid diffusion and the variation in mobile technology adoption in the world make its diffusion unprecedented (Kalba, 2008; ICT Update, 2008). Mobile phones are versatile: people use mobile phones for calls and text messaging, for reading and sending e-mails, taking and storing pictures, listening to music and performing a host of other tasks. As is probably the case in many other places, Ndukwe (2008) has observed that the needs, expectations and tastes of telecommunication service and product consumers in Nigeria vary. Roger (2010) has identified five GSM-based network and about 13 CDMA-based network operators in Nigeria. The GSM-based network operators are MTEL, ZAIN, MTN, Globacom, and Etisalat while the CDMA-

based network operators include Multilinks, Starcomms, O'Net and Visafone among others.

University students are a comparatively privileged and educated community, and they live in close proximity to one another, a characteristic that might be expected not to support the widespread use of telephones. An empirical study of the availability and use of mobile phones in Nigeria's premier higher educational institution, the University of Ibadan, in 2006 showed that mobile technology is however, common among students (Bodunwa and Olatokun, 2006). Beyond interpersonal communication and interaction among students, there might be latent and intrinsic factors that influence them to adopt the technology. For instance, students are mainly persons who have left their families, friends and relations for the purpose of education. Apart from the inevitable need to keep in touch with persons with whom they already have relationships such as parents and siblings, students maintain old friends and make new ones. However, studies that show empirically how perceived characteristics of mobile phones, demographic background of the students and psychological factors influence students' adoption of mobile telephony at the University of Ibadan, Nigeria do not exist. This is why this study is designed to understand how perceived characteristics of mobile phones, demographic characteristics of respondents and psychological variables relate to students' adoption of mobile telephony at the University of Ibadan, Nigeria.

Rogers (1983) attempted a formalization of the theory of diffusion of innovations. According to him, "diffusion of innovation occurs when the innovation is communicated through certain channels over time among the members of a social system". He suggested that the use of communication channels such as mass media and interpersonal communication also influence adoption. Then come the technological factors such as complexity, relative advantage and compatibility with lifestyles, observability and trialability, issues perceived by Rogers as characteristics of innovation, which also influence the penetration of the technology (Rogers, 1983).

Much of the research on the digital divide has consistently found a relationship between use of modern technologies and demographic, social and economic status of individuals. According to Wei and Zhang (2008), studies on different information technologies have shown that age, gender and level of study influence technology adoption. Many studies have shown that younger persons are IT savvy, more flexible with their income, and living away from home often compels students to make new friends (Leung 2007), relate with old friends and be in touch with

parents and relations.

Increasingly, the fastest penetrating technology in human history, the mobile phone, has become central to student information activities, playing very important roles in e-learning and e-health. Evidence abounds that mobile technologies are already being deployed to meet educational needs in Nigeria and elsewhere (Nwagwu, 2010). In the Philippines, students prefer mobile phones as a means of communication with both faculty members and their fellow students (Pabico, 2003; Mariano & De La Rosa, 2004). A study by Nonyongo, Mabusela and Monene (2005) in the University of South Africa established the critical role of SMS by students. Universities design SMS information systems to facilitate students' exchange of information with staff and to meet other communication needs. For instance, Makerere University in Uganda acquired a software called Broadcast System (Kajumbulla, 2007), similar to the Chikka Network in the Philippines (Mariano & De LaRosa, 2004), which administers SMS instant messaging to mobile phones or email addresses of students. In Nigeria, mobile technology is fast becoming an educational communication tool. At the University of Ibadan, mobile phones are students' companions and serve them various purposes; postgraduate and other categories of applicants in the university are notified of the result of their applications through bulk SMS.

The study is guided by three hypotheses:

1. There is no significant relationship between perceived characteristics of mobile phones namely trialability, relative advantage, compatibility, complexity and observability of the technology and its adoption.
2. There is no significant relationship between demographic characteristics of the respondents and the adoption of mobile phones among students of the University of Ibadan.
3. There is no significant relationship between psychological variables, that is, perceived popularity of the technology, its need, use of mass media and interpersonal communication and students' adoption of mobile telephony.

These hypotheses imply that the researchers will search for the factors that influence mobile penetration among students in the university within these constructs which are very prominent in Roger's theory.

## **Rogers' Diffusion of Innovations Theory**

Rogers' (1983) innovation diffusion theory formalizes the series of events that occur as individuals move beyond basic knowledge of a technology and decide whether the technology is favourable or unfavourable, and then decide whether to adopt the technology or not. When people adopt the technology and start using it, they may seek reinforcement of their adoption decision to adopt or may change their minds about the innovation. The major elements in Roger's theory are innovation and communication channels as well as time and social systems which are briefly reviewed here.

Generally, an innovation could be conceived of as an idea, practice, or object that is perceived as new by an individual or any other unit of adoption. Rogers (1983) considered five attributes: (i) relative advantage (ii) complexity (iii) compatibility, (iv) trialability and (v) observability of an innovation which influence its adoption.

Relative advantage is the degree to which an innovation is perceived as better than the innovation that was into existence before. The degree of relative advantage may be measured in economic profitability terms, but the effect on status, convenience and satisfaction are very important factors. According to Rogers, people who are planning to adopt new technology often want to understand whether the new idea is better than the old one.

According to Rogers, adopters also consider the complexity of a technology. They want to know whether the technology is more difficult to understand and use than an existing one. He suggested that when a technology is considered complex to use, adoption of the technology will be hampered.

Potential adopters also want to establish whether a new technology will disrupt their life styles and values within the adopter's social system. The more compatible an idea is with the expected users, the less uncertainty the potential adopters will be about the technology. If an idea will disrupt the values and norms of adopters within the social system, then such a technology may not diffuse properly. Usually, individuals alter their value systems before they adopt an

innovation that is alien to their original values.

Trialability is concerned with whether a potential adopter can try or experiment with a new idea in order to develop an opinion about the idea. The process of trial is often expected to be limited in terms of any risks. When people have tried out an idea, they are most likely to decide whether or not to adopt the idea more rapidly than otherwise. Rogers suggested that if a new idea is triable, then the rate of adoption will be higher.

Rogers also suggested that people will adopt an idea if the result of adoption by others is observable. The more observable an innovation is, the faster the adoption of the innovation will likely be. Hence, Rogers suggested a positive relation between observability and adoption rate.

Communication encompasses creating and sharing information in order to reach a mutual understanding about an issue. Communication is an old source of influence on human behaviour. A communication channel is technology through which individuals pass messages to one another. Rogers classified communication channels into two, namely mass media and interpersonal communication.

Mass media helps people to have information about a new technology or idea, particularly when the idea is very new. According to Rogers, mass media constitutes the most timely and cheapest means of informing potential adopters about the existence of a technology.

Mass media may play an important role in the persuasion and decision making stage about whether or not to adopt a technology, but physically interacting and receiving people's testimonies about a technology may make the adoption faster. This is very important because people need both factual and attitudinal information to reduce the uncertainty about a new idea.

In his later studies in 1995, Rogers suggested that demographic characteristics of individuals influence their adoption of new technologies. This suggestion has since been established by many other studies.

According to Rogers, there are five different categories of technology adopters. These are innovators, early adopters, early majority, late majority and laggards. Innovations spread when they meet the need of these successive segments.

In Rogers' study, innovators are the first 2.5 percent of the individuals in a system to adopt the idea. These people have great interest in new ideas, and this makes them less involved with a circle of local peer networks and leads them to affiliate to cosmopolitan social relationships. According to Nysveen and Sendecka (2006), being an innovator has several prerequisites. Innovators are persons that blaze trails. They have influence to control resources as well as the ability to understand and apply complex technical knowledge. Also, innovators are confronted with the challenges of coping with the uncertainty accompanying embracing new innovation. Innovators are therefore gate keepers and other adopters learn from their experiences.

In Rogers' opinion, early adopters are the next 13.5 percent of the individuals in a system to adopt an innovation. These adopters are people who have integrated into the local system more than the innovators. This is why Rogers refers to innovators as cosmopolites, while early adopters are referred to as localites. Since early adopters emanate from the localites, they often have a great influence in the adoption of innovation. Potential adopters build their confidence in an innovation through their experiences and opinions. Although early adopters are localites, they are usually ahead of the average individual in the system and therefore serve as role-models for members of the social system.

The early majority are the next 34 percent of the individuals in a system that adopts a new idea. They are usually not people that play opinion leadership roles in society, but their interaction with their peers is frequent and useful in the spread of ideas. The early majority therefore occupies a unique position intersecting the early and the late adopters, thus making them an important link in the process of diffusion. Practically, they learn about a technology from early

adopters and are not among the last to abandon an old technology

Rogers describes the next 34 percent of the individuals in a system to adopt an innovation as the late majority. They rank less than the average adopter in the system. In most cases, the spread of an idea to them is probably through their networks. Their adoption of the idea is therefore because they want to remain connected to their peers and other network members. These adopters have sounded the experiences of early adopters and other high level adopters to ensure that an innovation is economical, profitable and manageable.

The last 16 percent of the individuals in a system to adopt an innovation are regarded as the laggards. They have nearly zero opinion roles in the society. Laggards are localized adopters and are usually isolated elements in the social network. Laggards ride on the past experiences of other adopters. They have no confidence with innovations and are reluctant to accept change. Often due to limited resources, laggards want to be certain that an idea will not fail or that it has not failed others before they adopt the innovation.

## **Literature Review**

Before the innovation adoption theory of Rogers (1983), Tornatzky and Klein (1982) in a meta analysis of characteristics of innovation had found only relative advantage, compatibility and complexity to be consistently related to adoption decisions. Nysveen and Sendekka (2006) found that complexity is related to perceived ease of use. In an exploratory study of innovation constructs, O'Donnell and Sauer and (2007) observed that apart from compatibility, other characteristics of innovation represented multi-dimensional scales. This opinion agrees with Belanger, Lou and Slyke (2004) who suggested that compatibility should be viewed from the perspective of "compatibility with lifestyle" rather than anything else. Wei and Zhang (2008) added a third construct which they called "other functionally similar new media technologies". This is supported by Rogers (1995) in his concept of technology cluster in which he suggested that adoption of a technology in a cluster may lead to the adoption of another technology in the same cluster. According to this concept, the technologies people adopt could be useful in

predicting the new technologies they adopt.

Wei and Zhang (2008) observed that the adopters of new technologies are younger and more educated persons who have a higher income than others. Many studies have shown that gender plays an important role in technology adoption (Gefen and Straub, 1997; Morris and Venkatesh, 2000). When men decide to use a technology, their decision is often strongly influenced by the perceived usefulness or advantage of the technology in comparison with others, while ease of use is the major variable influencing women's decisions.

Peters (2007) showed that psychological perspective in mobile communication technology is generally concerned with people's perceptions, expectations and attitudes. It was recommended that the explanation and prediction of media technology use behavior is studied from multiple theoretical perspectives. In their study of the adoption and use of mobile phones in rural China, Wei and Zhang (2008) classified psychological factors into perceived characteristics, perceived popularity and perceived need.

Ahmad and Ahmad (2007) emphasised the importance of relative advantage in the Nigerian mobile market. Compared to the fixed line approach, they stated that the pay per service pricing strategy adopted by Nigerian mobile operators encourages the adoption of the service. Nysveen et al. (2005) used self control as a moderating factor for external and interpersonal influence (social influence). In their cross service study of the adoption of mobile services, they were unable to find any support for a strong social influence on the adoption of mobile services. This deviation provides an additional reason to investigate the role of social influence in mobile phone adoption. According to Wei and Zhang (2008), perceived need assumes that users are likely to move from the old medium to a new one when they discover the old medium cannot meet their needs. Araujo, Cardoso and Espanha (2008) stated that people use SMS to organise their day, while they may use phone calls to organise meetings with friends and families, thus achieving some coordination of their daily life routines. In their study of adoption and use of mobile devices by elderly people, Mallenius, Rossi, and Tuunainen (2007) noted that participants had diverse views about peers as a source of influence in adopting new innovations and services.

In Nigeria, digital mobile operation started in the year 2001, when ECONET (now Zain) was



licensed. By July 2007, the Nigerian Communication Commission Press Release (2007) reported that there was an expansion of telephone lines from “450,000 connected lines in May 1999 to over 38 million lines”. This boosted teledensity growth from 0.4 to 24. In March 2008, the Nigerian Communications Commission reported that there was a total of 60.9 million phone subscribers. The mobile telecoms penetration rate in Nigeria rose from 0.73 percent in 2001 to 32.79 percent in March 2008 (Agoi, 2008). This figure is highly significant because it represents about 21.6% of the 282 million mobile connections in Africa (GSM World, 2008). According to International Telecommunications Union (ITU), Nigeria with a mobile penetration rate of 26% and South Africa are Africa’s leading mobile telephony powerhouses. These two countries accounted for an amalgamated total of 45% of the continent’s industry (Africa News, 2010).

In a case study of GSM in Nigeria, Niran, Tella, and Paul (2009) noted that the potential for growth in the number of phone lines in the decade remains high. Mobile penetration in Nigeria increased with a net addition of 3,425,000 in the fourth quarter of 2007, and a further net addition of 7,146,000 at the end of 2008 (Nigeria Telecommunications Report, 2010). According to Nigeria Telecommunications Report (2009), it was envisaged that mobile penetration in Nigeria would rise to over 50% in 2009 and to about 106% penetration or over 184 million mobile subscribers at the end of 2013.

## **Methodology**

This study focused on undergraduate and postgraduate students of the University of Ibadan, Nigeria's first and biggest university, and it was guided by a sample survey design. The researchers visited the male and the female hostels and solicited the participation of the students through the relevant authorities. Copies of the questionnaire were deposited at the porters' lodge, and information leaflets appealing to students to complete the questionnaire were slipped into their rooms. A total of 400 copies of the questionnaire were distributed to the students. Three hundred and ninety four copies were completed and returned. Out of these, 14 were unusable because there was no response to some of the questions, and ten were unusable because of illegible responses . Hence, a total of 370 copies were analyzed.

## ***Measures and data analysis***

The demographic, technological and psychological characteristics were the independent

variables while adoption of mobile phone variable “Do you have a mobile phone?” measured on a dichotomous scale of yes or no was the dependent variable. Considering that the first mobile network (ECONET) came into Nigeria in 2001, the period 2001-2002 was intuitively allocated the period of early adopters, 2003-2006 as the early majority period, 2007-2010 was the late majority period while those without mobile phones were categorized as laggards. Next, for the purpose of ease of understanding of the frequencies, the perceived characteristics of mobile phones and perceived need for mobile phones and mass media use which were measured using a 5-point Likert scale, were recoded as follows: (1=strongly disagree) + (2=disagree) = (1=disagree), (3=do not know) = (2 =don’t know) and (4=strongly agree) + (5=agree) = (3=agree). Also, the perceived popularity of mobile phones, which was measured using a 5-point Likert scale, was recoded as; (1=almost nobody) + (2=a few) = (1=few), (3=about half) = (2 =about half) and (4=quite a lot) + (5=almost everyone) = (3=almost everyone). Lastly, interpersonal communication was recoded as: (1=very often) + (2=often) = (1=often), (3=not at all) = (2 =not at all) and (4=not often) + (5=not very often) = (3=not often).

Next, principal component analysis was used to assess the underlying structure of the 24 perceived characteristics of mobile phones which were grouped into five factors namely: relative advantage of mobile phones, complexity of mobile phones, trialability of mobile phones, observability of mobile phones and compatibility of mobile phones with lifestyle. Principal component analysis was also used to assess the underlying structure of the other 16 psychological factors in mobile phone adoption. These were grouped into four factors: perceived popularity of mobile phones, perceived need for mobile phones, mass media influence and interpersonal communication. Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett’s Test of Sphericity were used to establish whether there existed a sufficient number of items for the analysis and to find out if the correlation matrix that would result from the analysis was not an identity matrix. The acceptable Kaiser-Meyer-Olkin Measure value is usually greater than 0.70 while the significance value of its Chi Squared process should be less than 0.06 (Leech, Baret, Morgan 2005). To test the hypotheses, perceived ease of use and psychological variables were operationalised by computing the components that were extracted in the PCA. Acquisition of a mobile phone was accepted as a proxy for adoption. Functional relationship was examined using regression analysis.

**Table 1: Socio-demographics of the Respondents**

<b>Variable</b>	<b>Measurement</b>	<b>Frequencies</b>	<b>Percentage</b>
Age	≤18 yrs	56	15.1
	19-24 yrs	148	40.0
	25-30 yrs	131	35.4
	31-36 yrs	18	4.9
	≥36 yrs	17	4.6
Highest educational status of father	No response	6	1.6
	None	14	3.8
	Primary	19	5.1
	Secondary	44	11.9
	College of Education/Poly	47	12.7
Parent closest to student	No response	34	9.2
	Father	83	22.4
	Mother	236	63.8
	Other	17	4.6
Occupation of mother	No response	11	3.0
	Self employed	169	45.7
	Private sector	32	8.6
	Public sector	147	39.7
Type of residence	No response	5	1.4
	Living in hostel	305	82.4
	Living off hostel (on own)	47	12.7
	Living off hostel (parents)	13	3.5
Highest educational status of mother	No response	8	2.2
	None	19	5.1
	Primary	35	9.5
	Secondary	52	14.1
	College of Education/Poly	100	27.0

	University	156	42.2
Occupation of father	No response	15	4.1
	Self employed	151	40.8
	Private Sector	63	17.0
	Public Sector	131	35.4
	Unemployed	10	2.7

## Results

### *Socio-demographic characteristics of the respondents*

Table 1 presents the socio-demographic characteristics of the respondents. The majority of the respondents were aged below 30 years. The majority of the fathers and the mothers of the respondents had college, polytechnic or university education. The majority were closer to their mothers than to their fathers. The great majority lived in university hostels. The fathers of approximately 40% of the respondents were self employed, 35 % were employed in the public sector and 17 % in the private sector.

### *Technology and psychological characteristics of mobile phones*

The technology characteristics of mobile phones examined are the perceived characteristics of the mobile phone while the psychological characteristics of the technology are perceived popularity, perceived need and communication factors.

#### *i. Perceived technology characteristics of mobile phone*

The first element in this category is relative advantage consisting of ease of availability and whether the technology is cheap, safe and easy to use. Most of the respondents (84.1%) agreed that mobile phones are easily available, but only 48.1%, 69.5% and 84.1% respectively considered mobile phone as cheap, safe and easy to use.

The next element is the complexity of mobile phones, in which 89.2% respondents reported operating mobile phones as not being a problem, although 72.4% suggested that network failure is a major disadvantage. Furthermore, 58.1% were of the opinion that mobile phones attract thieves, 80.5% reported difficulty in using mobile phones while the same percentage had problems using mobile phones for SMS. The trialability of mobile phones is the

next item. Many (78.1%) reported that it was easier buying a mobile phone after trying it out, 79.7% suggested that it would be better to test a mobile phone before buying one, but as many as 63.2% did not consider it necessary to try a mobile phone before buying it.

For observability, many of the respondents (78.1%) reported being influenced by the observed benefits of the technology; 65.4% were not influenced by others, 82.4% were satisfied with the result of using a mobile phone, 82.4% and 83.8% were of the opinion that the mobile phone was worth its value. For compatibility with life style, 84.6% reported that mobile phones fitted their social life, 83.5% said that they enjoyed using mobile phones because of the applications while 45.4% were using mobile phones because of the brand name. The durability of mobile phones encouraged 83.8%, its use in managing time attracted 68.4% while its role for academic purposes was reported by 75.9%. The opinions of the respondents suggested that aesthetic factors like shape or colour of the phone (57.6%) and smallness (46.8%) were not major factors influencing their adoption of mobile phones.

*(ii). Psychological characteristics of mobile phones*

(a). Perceived popularity of mobile phones

The results of the perceived popularity of mobile phones show the ubiquity of mobile phones around the students. Table 2 suggests that almost all (91.4%) relatives, friends and acquaintances

**Table 2: Perceived Popularity of Mobile Phones**

<b>About how many people in the following groups do you know use mobile phones?</b>	<b>Almost everyone</b>	<b>Few</b>	<b>About half</b>	<b>Missing</b>
Relatives, friends and acquaintances	91.4	5.4	1.9	1.6
Community	86.2	5.4	5.9	2.4
General population	84.9	5.4	7.6	2.2

of the respondents use mobile phones. Also, Table 2 suggests that almost every member of the community (86.2%) and the general population (84.9%) around the respondents make use of mobile phones.

(b). Perceived need for mobile phones

Mobile phones are generally human companions. The survey listed a few of the major needs that

may require the use of mobile phones and investigated how each of these variables influenced respondents' decision to buy mobile phones. Table 3 shows that the ease of contacting people was reported by the

**Table 3: Perceived Need and Mass Media Influence**

<b>Do you agree with the following statements?</b>	<b>Agree</b>	<b>Disagree</b>	<b>Don't Know</b>	<b>Missing</b>
Mobile phone can help me contact people more easily.	94.6	3.5	1.4	0.5
Mobile phone can help me to study more efficiently.	67.8	17.0	14.3	0.8
Mobile phone is a symbol of fashion & status.	36.5	48.6	13.8	1.1
Mobile makes me feel more secure when I am out of town.	73.2	15.7	10.0	1.1
More convenient to chat with my relatives and friends	82.2	13.5	3.8	0.5
Newspaper report influenced my mobile phone adoption.	27.3	51.4	20.8	0.5
Radio influenced my mobile phone adoption.	32.4	49.7	17.3	0.5
Television influenced my mobile phone adoption.	38.1	45.7	15.4	0.8
Internet browsing influenced my mobile phone adoption.	56.2	33.5	8.9	1.4

largest proportion of students (94.6%), followed by those who purchased the technology because they wanted to exchange live information with their acquaintances (82.2%). Mobile phones made 73.2% feel more secure when out of town, and helped 67.8% to study efficiently, and 48.6% of the respondents disagreed that mobile phone is a symbol of fashion and status.

(c). Communication factors

The use of modern information technologies and the use of mass media are complementary. This is why this study examined some communication characteristics such as mass media and interpersonal communication. Table 3 also presents data on mass media and mobile phone adoption, and it suggests that newspaper, radio and television influenced the decision of 27.3%, 32.4% and 38.1% respondents respectively, but 56.2% reported that they were influenced by the Internet. A large percentage of respondents (51.4%) disagreed with newspapers as a source of influence, while listening to radio and listening to/watching television could not influence the decision of 49.75% and 45.7% respondents respectively.

***Ownership of a mobile phone***

Most of the respondents (41.9%) have one mobile phone; 42.4% have two mobile phones while

8.6% reported having more than two phones.

### Further statistical analysis

PCA was used to reduce the 24 perceived characteristics of mobile phones and 16 psychological factors in mobile phone adoption.

#### *The structure of perceived technology characteristics in mobile phone adoption*

Table 4 shows the structure of perceived characteristics in mobile phone adoption. The first factor, relative advantage consists of ease of availability, ease of use, cheapness and safety of the technology. Ease of use and ease of availability have the highest mean score (2.73 and 2.71), and together explain 64% of the variation in the factor. The second factor, complexity of mobile phones consists of operating mobile phones on one's own, difficulty in using mobile phones, difficulty in using SMS, and the attraction of the technology to thieves and network failure. In this category, operating mobile phones on one's own has the highest mean score (2.80), while the attraction of mobile phones to thieves has the highest deviation from the mean (0.88). However, operating mobile phones on one's own and the difficulty in understanding how to use mobile phones give cumulative eigenvalues of 53.10%, indicating that these two components sufficiently absorb the variation of complexity of mobile phones. For trialability, the ease of use of mobile phones after trying them out has the highest mean score (2.65) compared to other factors in the group, while the time it takes to try mobile phones before agreeing to buy one has the greatest deviation from the mean (standard deviation=0.90).

**Table 4: Perceived characteristics in mobile phone adoption**

Perceived characteristics of mobile phones	Mean	Standard deviation	Factors				
			1	2	3	4	5
<b>Relative Advantage</b>							
Mobile phones are easily available	2.71	0.70	0.74				
Mobile phones are easy to use	2.73	0.65	0.70				
Mobile phones are cheap	2.02	0.98	0.54				
Mobile phones are safe	2.51	0.79	0.47				

<b>Complexity of mobile phones</b>							
I operate mobile phone on my own	2.80	0.60		0.70			
It is difficult to use mobile phones.	1.27	0.68		0.69			
SMS is difficult to use.	1.29	0.65		0.44			
Mobile phones attract thieves.	2.32	0.88		0.58			
Network failure is a disadvantage	2.50	0.85		0.51			
<b>Trialability of mobile phones</b>							
Test mobile phone before buying one	2.62	0.79			0.84		
Take time to try before buying	1.60	0.90			0.47		
<b>Observability of mobile phones</b>							
Mobile phone is worth its value.	2.70	0.74				0.81	
Satisfied with using mobile phones	2.67	0.76				0.91	
Influenced by benefits of mobile phones	2.59	0.82				0.30	
Influenced by others to buy a mobile phone	1.57	0.89				0.48	
<b>Compatibility of mobile phones with lifestyle</b>							
Enjoy mobile phones for their applications	2.71	0.72					0.76
A mobile phone is durable.	2.69	0.74					0.67
A mobile phone fits my social life.	2.74	0.67					0.60
A mobile phone fits into my academic life.	2.58	0.82					0.52
A mobile phone helps me manage my time.	2.48	0.84					0.36
I use a mobile phone for its brand name.	1.97	1.00					0.29
I use a mobile phone for its shape/look.	1.68	0.93					0.33
I use a mobile phone because it is small.	1.89	0.98					0.42
<b>Percent of variance explained</b>			64.44	53.10	80.15	71.99	59.20
<b>KMO and Bartlett's test (sig. level)</b>			0.00	0.00	0.00	0.00	0.00



These two components account for 80.15% of the variation. For observability, the opinion that a mobile phone is worth its value and the opinion that the adopters are satisfied with the technology explain 71.99% of the variation. Regarding compatibility with one's social life, enjoying using mobile phone because of the applications as well as the durability of the technology explains 59.20% of the variation.

**Table 5: The structure of psychological factors of mobile phone adoption**

Factors	Mean	Standard deviation	Factors			
			1	2	3	4
<b>Perceived popularity of mobile phones</b>						
Community	2.76	0.66	0.92			
General population	2.75	0.65	0.43			
Relatives, friends and acquaintances	2.82	0.59	0.30			
<b>Perceived need for mobile phones</b>						
Convenient to chat with relatives and friends	2.68	0.72		0.71		
Help to contact people more easily	2.90	0.44		0.94		
Make me feel secure when out of town	2.55	0.79		0.65		
A symbol of fashion and status	1.86	0.94		0.43		
Can help to study more efficiently	2.49	0.80		0.52		
<b>Mass media</b>						
Listening to radio influenced my adoption	1.82	0.90			0.86	
Newspaper report influenced my adoption	1.75	0.86			0.73	
Television influenced my adoption	1.91	0.93			0.32	
Internet browsing influenced my adoption	2.20	0.96			0.35	
<b>Interpersonal communication</b>						
Interaction with family members	1.42	0.81				0.82
Interaction with friends	1.40	0.80				0.62

Interaction with the general population	2.21	0.94				0.48
Interaction with community members	2.23	0.91				0.33
<b>Percent of variance explained</b>			83.13	58.08	64.24	82.96
<b>KMO and Bartlett's test (sig. level)</b>			0.00	0.00	0.00	0.00

### **The structure of psychological characteristics of mobile phones**

Table 5 contains the structure of the other factors consisting of popularity of mobile phones, perceived need of the technology, mass media and interpersonal communication. The first factor, perceived popularity consists of community, general population and relatives, friends and acquaintances. Within this group, relatives/friends/acquaintances have the highest mean score (2.82) compared to other factors in the group, while community shows the greatest deviation from the mean (standard deviation=0.66). The first factor was loaded on community which accounted for 83.13%, indicating that this variable is sufficient to represent the first group.

Perceived need for the technology constitutes use of mobile phones in contacting people more easily, the help a mobile phone offers in studying more efficiently, the symbolism of a mobile phone in fashion and status, the feeling of security due to a mobile phone and the convenience of chatting. Within this group, mobile phones help to ease contacting people has the highest mean score (2.90) while the symbolism of a mobile phone for fashion and status has the greatest deviation from the mean (0.94). The factor was loaded on the convenience of technology, which accounted for 38.33% of the total variation as well as using mobile phones to help contact people more easily, which accounted for 19.76%. Altogether, these two components accounted for more than 50% of the whole variation. The next factor, mass media consists of influence of newspaper on mobile phone adoption, the influence of listening to radio, listening to/watching television and Internet browsing. Within this group, Internet browsing shows the highest mean score (2.20) and the greatest deviation from the mean (0.94). The factor was loaded on listening to radio, which accounted for 64.24% of the total variation.

The next factor, interpersonal communication consists of interaction with family members, interaction with friends, interaction with community members and interaction with people in the general population. In this factor, interaction with community members has the highest mean score (2.23) while interaction with people in the general population shows the greatest deviation from the mean (0.96). Further, the factor was loaded on interaction with family

members which accounted for 53.29% of the total variation.

### Testing the hypotheses

The extracted factors were recomputed to describe relative advantage, complexity, trialability, observability and compatibility of mobile phones. The same computation was adopted for psychological variables of perceived popularity, perceived need, mass media use and interpersonal communication. These new variables and the demographic characteristics constituted the independent variables whose influence on the adoption of the technology was investigated using regression analysis.

**Hypothesis One:** *There is no significant relationship between perceived characteristics of mobile phones and its adoption.* Table 6 shows that for the relationship between adoption of mobile phones and characteristics of the technology, all the characteristics except observability have significant relationship with whether students would embrace the technology or not.

**Table 6: Relationship between adoption of mobile phones and technology factors**

	Beta	B	Sig. Level
<b>Perceived characteristics</b>			
Relative advantage of mobile phone	0.144	0.236	0.006
Complexity of mobile phone	0.232	0.464	0.000
Trialability of mobile phone	0.130	0.187	0.013
Observability of mobile phones	0.042	6.91E-02	0.422
Compatibility of mobile phone with lifestyle	0.107	0.177	0.042

Relative advantage ( $r=0.144$ ,  $p=0.000$ ) has perfect significant relationship with a correlation value of 0.144.

**Hypothesis Two:** *There is no significant relationship between demographic characteristics of the respondents and the adoption of mobile phones among students of the University of Ibadan.*

**Table 7: Relationship between demographic factors and adoption of mobile phones**

<b>Demographics</b>	<b>Beta</b>	<b>B</b>	<b>Sig. level</b>
Age of respondents	-0.375	-0.229	0.000
Gender (Ref category=female)			
<i>Male</i>	0.101	0.120	0.053
Educational status of father (Ref category=None)			
<i>Primary</i>	0.041	5.263E-02	0.819
<i>Secondary</i>	0.137	0.205	0.304
<i>Tertiary</i>	0.003	-6.97E-03	0.965
Educational status of mother (Ref category=None)			
<i>Primary</i>	0.179	0.263	0.195
<i>Secondary</i>	0.232	0.379	0.051
<i>Tertiary</i>	0.127	0.294	0.035
Occupation of father (Ref category=unemployed)			
<i>Self employed</i>	-0.041	-0.107	0.607
<i>Private sector</i>	0.007	1.111E-02	0.956
<i>Public sector</i>	0.030	-6.18E-02	0.725
Occupation of mother (Ref category=unemployed)			
<i>Self employed</i>	-0.128	-0.334	0.087
<i>Private sector</i>	-0.300	-0.457	0.050
<i>Public sector</i>	-0.162	-0.350	0.042
Level of study (Ref category=Undergraduates)			
<i>Masters</i>	-0.298	-0.357	0.000
<i>Ph.D.</i>	-0.027	-7.26E-02	0.679
Parent closest to (Ref category=Other)			
<i>Father</i>	-0.027	-4.54E-02	0.789
<i>Mother</i>	-0.044	-9.65E-02	0.480
Religion (Ref category=others)			
<i>Islamic</i>	0.292	0.826	0.046

<i>Christianity</i>	0.113	0.676	0.044
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Table 7 shows that the age of the respondents is negatively significantly related to adoption of mobile phones ( $r=-0.375$ ,  $p=0.000$ ). Although the magnitude is relatively low, the negative correlation suggests an inverse relationship to the extent that older persons might be less adept in adopting the technology. The respondents are less likely to be males as the relationship between gender and adoption of mobile phone with reference to female ( $r=0.101$ ,  $p=0.053$ ) is not significant and the correlation value is very low. With reference to respondents whose fathers have no education at all, the adopters are also not differentiated by educational status of their fathers as there is no significant relationship whether the fathers of the respondents have primary, secondary or tertiary type of education. With reference to respondents whose mothers have no education, adopters of mobile phones are more likely to have mothers that have tertiary educational status ( $r=0.127$ ,  $p=0.035$ ).

In further reference to respondents' parents' employment, adoption of mobile phones is not significantly related to the occupational status of the respondents' mothers. Although the correlations are negative, students whose mothers have public sector type employment are likely to adopt mobile phones ( $r=-0.162$ ,  $p=0.042$ ) more than those whose mothers are employed in the private sector ( $r=-0.300$ ,  $p=0.05$ ). For occupation of fathers, there is no significant relationship whether the fathers of the respondents work in private sector, public sector or are self employed. Compared with undergraduates, students who are registered for master's degrees are more likely to adopt mobile phones ( $r=-0.298$ ,  $p=0.000$ ) than those that registered for Ph.D. Being close to their mother or their father does not relate significantly to respondents' adoption of the technology. Regarding religion and in reference to those who reported having no religious affiliation, Christians have a higher likelihood ( $r=0.113$ ,  $p=0.044$ ) than Muslims of adopting telephones ( $r=0.292$ ,  $p=0.046$ ).

***Hypothesis 3: There is no significant relationship between psychological variables and the students' adoption of mobile telephony.***

Psychological variables consist of perceived popularity, perceived need, mass media and interpersonal communication variables. It was also found that with a positive and significant slope ( $B=0.375$ ,  $p<0.05$ ), increasing popularity of mobile phones results in its increasing adoption. However, the perceived popularity of mobile phones explained only 3.9% of the total

variance in the adoption of mobile phones and the correlation is positive and weak ( $r=0.204$ ). Generally, the null hypothesis is rejected instead of the alternate hypothesis. Regarding perceived need, the result indicates a positive and significant slope ( $B=0.490$ ,  $p<0.05$ ), leading to a rejection of the null hypothesis although only 3.0% of the total variance in adoption of mobile phones was explained by the perceived need. Moreover, the result shows a positive and weak correlation ( $r=0.181$ ). For the communication variables, namely mass media and interpersonal influence, mass media has a positive and significant slope ( $B=0.153$ ,  $p<0.05$ ) although mass media use explained only 1.2% of the total variance in the adoption of mobile phones. Hence, it can be concluded that mass media actually influenced adoption of the technology. Surprisingly, interpersonal communication shows a negative and non-significant slope ( $B=-0.003$ ,  $p>0.05$ ) with adoption of mobile phones, with a resultant rejection of the alternate hypothesis.

## **Discussion**

This study confirms that mobile phones are ubiquitous among students as almost everyone has at least one, confirming a cursory observation that ease of availability and ease of use of mobile phones are the major relative advantage variables proffered by more than eight out of every ten students. Mobile phones are really everywhere, an opinion that might even positively influence its price or the issue of safety of the technology, issues which the students do not consider major constraints. Like most household items in Nigeria, mobiles are imported mainly from China, a country associated with mass production of low cost electronic and other facilities, in addition to used mobile phones which come from various countries.

Respondents in this study are mainly young people below 25, who are technology savvy, and who could always spare time to learn to use complex functions in their phones. This is one of the reasons why complexity of the technology does not seem to be a problem for the students. Most students operated the technology on their own, although the network problem inhibits their maximum deployment of the technology. Related to this, only a few students reported having any difficulty understanding how to use the technology although the attraction of thieves constitutes an issue for about six out of ten users. The natural expectation that one should try a technology before buying it was mentioned by about eight out of ten students. For most students, mobile phones are worth their value and they are also satisfied with the benefits they derive from using the technology. Moreover, the majority of the students did not report any social

incompatibility with the technology. Rather they seem excited by the applications of the technology. The result shows further that students' need for interconnecting with people using the technology is the major perceived need. The adoption of the technology by students does not seem to be much influenced by the mass media. With most students using mobiles, students did not require any other source in order to acquire the technology. Of all the characteristics of the mobile phone, it was only observability that could not significantly predict adoption.

Although mobile technology was adopted in Nigeria in 2001, the largest number of adopters were the early majority and they acquired one in the period between 2003 and 2006. The small number of early adopters during the period 2001-2003 might have been influenced by the period required by people to test the technology, its initial high cost, and the challenges associated with interoperability among others. There are differences between this result and others on the same subject matter, particularly Rogers' (1983) study. The present study shows that students who were early adopters of the technology were fewer than their counterpart in Rogers' study, although the early majority was almost twice than those in Rogers' study. Apart from the social and other differences in the respondents, our study would seem to suggest that student adopters of the technology probably have more frequent interaction among themselves than the subjects used by Rogers.

This opinion is confirmed by the low proportion of late majority and laggards. Students are a more interactive and cohesive group who live together and may not necessarily be relating with one another on the basis of social differences. In a sense, it does appear that mobile technology bridges the digital divide between cosmopolites and localites as well as between the role models and those who may seldom play leadership roles. The 'halving' of the late majority in this study in comparison with Rogers' probably shows increasing peer pressure from early adopters on the other categories. Furthermore, the negligible number of laggards shows that mobile technology has reduced the "localized adopter category" and reduced the number of isolated persons in the students' social networks, as well as the proportion of people who express apprehension over the technology. Adoption of mobile technology among the students appears to transcend economic and other social boundaries and there is probably a reduction in the number of people who would want to use other persons' experiences as a springboard for decision to adopt.

The finding of a significant negative relationship between the adoption of mobile phones

and the age of the respondents confirms those of many small and large scale studies in various places (Helmersen and Ling, 2000; Leung 2007). Young people are more mobile savvy than their seniors. Mobiles are actually bridging the distance between students and their parents when they are in school, but the technology serves this purpose more for younger students who are not living in hostels. This study also shows that Muslim and Christian students living on their own and off campus are better adopters of mobile phones than those living with their parents. Closeness to any parent is not significantly related with adoption of mobile phones.

An interesting but recurrent finding in the relationship between demographics and adoption is the negative correlation of age of males with the adoption of a mobile phone. Younger males adopt mobile phones more than the older ones. This agrees with Helmersen's and Ling's (2000) research in Norway in which they observed that the mobile telephone is almost ubiquitous among 18 to 20 years old. Another finding that is of interest in this study is the negative and significant relationship between mothers working in the private and the public sector with mobile phone adoption. Tertiary status of education of mothers as well as secondary status of both parents influenced the adoption of mobile phones.

Our result deviates from the findings of Meso, Musa, and Mbarika (2005) in their study of Sub-Saharan Africa generally in which they found that advanced education influences the use of a technology. Students enrolled for PhDs appear to be less intensive adopters of mobile phone in comparison with those at the master's and bachelor's programmes who adopted the technology. The positive effects of relative advantage, compatibility and trialability and their direct relationship with adoption of the technology as well as the significant effect of complexity agree with Rogers' (1983) findings. Tornatzky and Klein (1982) in a meta-analysis of innovation characteristics and innovation adoption implementation noted that only relative advantage, compatibility and complexity were consistently related to adoption decisions. Our results suggest, however, in addition to these three constructs in Tornatzky and Klein's study, that trialability also plays an important role in students' adoption of mobile phone. Igbinedion and Olatokun (2009) found in their study on the use of ATM that relative advantage and compatibility had almost the same impact on adoption while observability had the highest impact.

The result of a positive and significant relationship between the perceived popularity of mobile phones and the adoption of mobile phones agrees with the findings of Pok and Teo



(2003) on how internet users adopt mobile phones. It also agrees with Mallenius et al. (2007) on factors affecting the adoption and use of mobile devices by elderly people. However, this result does not support the findings of Pedersen (2002) on the adoption of mobile services and the result of Wei and Zhang (2008) on the adoption of mobiles in China. The impact of perceived need represented by “using mobile phone to contact people more easily”, on mobile adoption is positive and significant, a result that agrees with the findings of Aoki and Downes (2004) as well as with the findings of Araujo et al. (2008) on the impact of using mobile phones to contact families and friends. Further, f Nwagwu’s (2007) study carried out on the Internet among adolescent girls in a city in Nigeria- found listening to radio as compared to other media for information has the highest impact on mobile phone adoption. It is noteworthy that most mobile phones now come with radios.

### **Recommendations and conclusions**

The pertinent recommendations arising from this study are directed to telecom companies. The significant influence of complexity, relative advantage, trialability and compatibility of the technology with youth lifestyle could guide the companies in targeting student audiences, designing handsets and advertising and marketing strategies. Although youth already constitutes a huge market for mobile technologies, increasing the mobile complexity through increased functionalities and services as well as offering sample products to youth audiences could boost the mobile market tremendously. Furthermore, the persuasive role of mass media such as radios in mobile adoption among the students support increasing incorporation of multimedia and mass media services in all mobile phones irrespective of their level of sophistication.

This study suffers some constraints. Given the proximity and close link among the students which could reduce the significance of using the technology for interpersonal communication, an in-depth discursive technique might have better unearthed latent explanations on the subject matter. A more diverse and unexpected group of respondents would perhaps have produced some surprises. Also, coupled with the adoption of advanced statistical techniques, the adoption of Rogers’ model imposed patterns and variables on the research, thus reducing the wide range of options that would have possibly provided a much deeper insight into the subject matter.

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