Predictors of Use of Mobile Applications by University Students in Oyo State, Nigeria

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Abstract
Mobile applications adoption rate has been growing at high rates due to rapidly expanding access by and understanding of smartphones by young and old people alike.. This study investigated the factors that affect or are likely to influence adoption and use of mobile applications by university students in Oyo State, in South West Nigeria, using a modified Unified Theory of Acceptance and Use (UTAUT) model as theoretical guide. A survey research design was used in which 1,105 respondents were targeted using a multistage sampling procedure, from which 1,048 completed copies of a designed and validated questionnaire were received, giving a 94.8% response rate out of which 1,019 were found suitable for analysis. The study revealed that Google Play was the most used mobile app store, while Facebook was the most used app among the students. Students use mobile applications frequently and virtually every day despite their busy academic schedules, and they mostly use them for social networking, education and news. Performance expectancy, effort expectancy, social influence and price were found to be important predictors of adoption of mobile apps, which are used to satisfy both academic and non-academic goals. The study concluded that the use of mobile applications as tools for educational purposes has great potential to boost academic activities and performances of the students, although price and other challenging features of the apps may constrain ease of access to and use of mobile apps. Developers and marketers of mobile apps should give serious consideration to these user challenges in the application development processes.

Keywords: Mobile Applications, Technology Adoption, University Students, \Modified UTAUT.

Background

Presently, mobile communication is so integrated into peoples' lives that many feel uncomfortable without a cell phone, even though once upon a time, the most popular functions of phones were for making voice calls and sending texts (Clark, 2011). The recent advances regarding cellular phone technology have enabled mobile devices to perform functions previously not possible with handheld devices and these advanced functions have been captured by smartphones (Chen, Park, and Putzer, 2010).Mobile application, commonly called mobile app, is defined by Gadhavi and Shah (2010) as a computer program designed to perform specific functions directed at the end user on the move or other application programme. Mobile apps can be used on mobile devices such as smartphones and tablets. Smartphones according to Pitchayadejanant (2011) offers more advanced computing ability and connectivity than a basic phone and runs complete operating system software which serves as a platform that allows users to install and run mobile apps. According to Roberts (2013), the mobile app evolution dates back to the development of iPhone applications.

Statement of the Problem

There is a great deal of research on adoption of mobile phones and mobile related services (Jiang, 2009 as cited in Garg and Garg, 2011). The researches have used different research methods and models and range from mobile Internet services, mobile device features and services, mobile value added services, and mobile data service usage (Garg and Garg, 2011; Idowu, Idowu and Adagunodo, 2004; Omonijo, Nnedum and Ezeokana, 2011; Utulu and Alonge, 2012). Literature also revealed that research on usage of mobile applications have been carried out in other parts of the world like

Singapore, Germany and Finland (Lee, Kim and Choi, 2012; Xu*et al.* 2011; Verkasalo, López-Nicolás, Molina-Castillo and Bouwman, 2010). While some of these studies focused on adoption and use of mobile phones in Nigeria and used student population as their respondents, there exists a knowledge gap on adoption and use of mobile applications on these phones. Oluwole (2012) revealed that web browsing, instant messaging and social networking facilities on smartphone devices are used by students. There is however need to extensively investigate adoption and use of mobile applications by students in different levels and types of education institutions, given the potential productive uses of mobile apps for educational and other purposes in students' daily activities. Focusing on this knowledge gap, the objectives of this research includes identifying types of mobile applications used by university students, establishing the level of awareness and preference of these apps, and investigating factors predicting adoption and use of these applications.

Research Objective

The major objective of this study is to examine predictors of adoption and use of mobile applications by university students in Oyo state, Nigeria from an adapted UTAUT model perspective. Other objectives includes finding out:

a) Which mobile app stores are mostly used by the students?
b) Which mobile apps are mostly used by the students?
c) What do the students mostly use mobile apps for?

Research Hypotheses

$H_0$1A: Performance Expectancy, Effort Expectancy, Social Influence or Cost (Price) has no individual significant predictive relationship with adoption of mobile applications by the students.

$H_0$1B: Performance Expectancy, Effort Expectancy, Social Influence and Cost (Price) have no joint significant predictive relationship with Adoption of mobile applications by the students.

$H_0$2A: Adoption or Facilitating Conditions has no individual significant predictive relationship with Use of mobile applications by the students.

$H_0$2B: Adoption and Facilitating Conditions have no joint significant predictive relationship with Use of mobile applications by the students.

Hypotheses $H_0$1A and $H_0$1B pertain to the factors that might influence Adoption (download and installation) of mobile apps, while hypotheses $H_0$2 and $H_0$2B pertain to the factors that might influence actual Use of installed apps.

Literature Review

A mobile application is a type of application software designed to run on a mobile device, such as a smartphone or tablet computer. Mobile applications frequently serve to provide users with similar services to those accessed on PCs. (https://www.techopedia.com/definition/2953/mobile-application-mobile-app). According to Lee *et al.* (2012), the existence of marketplaces and platform application programming interfaces (APIs) has made it more attractive for some software developers to implement apps for use on the different operating systems platforms of computers and mobile devices rather than implement complete web-based services. Such apps are them made available for download, free or paid for, from websites known as app stores. Mobile phones providers such as Nokia, Blackberry, Techno and Samsung provides enough applications for download in their mobile app store for the benefits of their users. Today, several app stores for different operating systems like iOS, Windows OS, Blackberry OS, Android and so on, can be can be accessed for use on mobile devices. However, among the major app stores are:

- *Blackberry World:* BlackBerry World previously known as BlackBerry App World is an application distribution service and application by BlackBerry Limited for many BlackBerry devices. The number of apps in the apps store is about 130,000 (Chen, 2013 as cited in Arthur, 2013) with over three billion downloads (D'Orazio, 2012).
- *Google Play Store:* Formerly called Android Market, Google Play is a digital distribution platform operated by Google which serves as the official app store for the Android operating system. Users may download Android applications from a developer's website or through a third-party alternative (Ganapati, 2010). There are a lot of alternative Android app stores

(Hill, 2013). These include Amazon, Samsung Galazy Apps, Mobogenie, 1Mobile Market and so on. In November 2014, there were approximately 1.4 million apps available on Android with over 1.2 million free apps and over 200 thousand paid apps according to AppBrain Statistics (2014) and the estimated number of applications downloaded from Google Play is over 50 billion (Warren, 2013).

- *Nokia Store:* The Ovi Store which was launched worldwide in May 2009 (Eddy, 2009) enables customers to download mobile games, applications, videos, images, and ringing tones to their Nokia devices. Ovi Store was renamed Nokia Store in October 2011 (Fraser, 2011b). The store has been growing considerably and has surpassed the 100,000 apps mark (GSM Arena, 2011).
- *Apple App Store:* Apple App Store is an online store for purchasing and downloading software applications and mobile apps for Apple devices. The store was opened in July 2008. There are more than 1.3 million apps available on the Apple App Store as at September 2014 and over 85 billion cumulative number of downloads from July 2008 till October 2014 according to Statista (2015). In 2017, free app download volume is projected to grow to 253.91 billion downloads while paid app is forecasted to be at 14.78 billion.

Usages of mobile applications

Mobile applications are diversely used in advertising, health, education, manufacturing, social networking, banking, marketing, payments, news updates among others. But for the purpose of this study, emphasis is laid on applications used for news, games, health, education, banking and social networking which are very much sought after by the youth, including adolescents and students. Mobile technologies are transforming college students' academic lives, including what and how they learn within and outside the classroom (Chen and deNoyelles, 2013).

Bankole, Bankole and Brown (2011), investigated the nature and determinants mobile banking (M-banking) adoption in Nigeria, where the respondents were m-banking customers including students. The study found out that that effort expectancy (perceive ease of use) positively influences behavioural intention to use M-Banking services and that users are willing to use m-banking if they find it useful for their everyday life. The survey also shows m-banking users are not influenced by social effects such as friends, relatives, colleagues at work and the m-banking providers. Odumeru (2013) further suggested that it is imperative for relevant stakeholders to make m-banking more popular and also step up education and enlightenment campaigns with more attention on very yound and older than forty years people to increase the popularity of m-banking. Idowu *et al.* (2004), in their comparative study of ICTs in higher educational institutions in Nigeria and Mozambique reported that epileptic power supply and difficulty in combining the rigors of academic work with the use of Internet are among the major constraints in accessing Internet-based services. Access to such services is often needed in real time when using mobile apps.

Research Framework

In this study, Venkatesh, Morris, Davis and Davis (2003)'s Unified Theory of Acceptance and Use of Technology (UTAUT) is used as the baseline model for predicting and understanding the factors that that would predict or influence the adoption and use of mobile applications. UTAUT had been used in several studies relating to students (Abu-Al-Aish and Love, 2013; Ju, Sriprapaipong, and Minh, 2007; Lee *et al.*, 2012; Liu, 2008; Moran, Hawkes and Gayah, 2010).However, various other modified UTAUT versions have been proposed in the information system world for understanding individuals' acceptance and intention to adopt new technologies (Abu-Al-Aish and Love, 2013). For instance, Abu-Al-Aish and Love (2013) extended the UTAUT for understanding of mobile learning acceptance by adding quality of service and personal innovativeness to the structure of UTAUT, and found out that in addition to performance expectancy, effort expectancy and influence of lecturers, both quality of service and personal innovativeness were also significant predictors and possible factors that affect behavioural intention to use m-learning by the surveyed students. Prior experience of mobile devices was also found to moderate the effect of these constructs on behavioural intention. Katagiri and Etor (2012) conducted a research trial to predict future usage of smartphone applications among university students and found out that usage history enables highly accurate predictions.

Prominent among the other factors that are introduced by these modified UTAUT version is price or cost of acquiring a new technology for use. Venkatesh *et al*. (2012) defined price as consumers' cognitive tradeoff between the perceived benefits of the applications and the monetary cost for using them; and suggests that ratio of perceived benefits over monetary sacrifice (i.e., the price value) of IT applications can influence consumers' technology use. Although price value may be subsumed as a component of facilitating (purchase market) conditions, it is often explicitly identified in the modified UTAUT versions as an additional construct to the performance expectancy, effort expectancy, social influence and facilitating conditions of the traditional UTAUT, to represent the cost of technology use in the consumer setting, as seen in Venkatesh, Thong and Xu(2012). In their study, Venkatesh, Thong and Xu (2012) presented an extension of UTAUT by identifying key additional constructs (hedonic motivation, price value and habit) and relationships to be integrated into UTAUT, thus tailoring it to a consumer use context and found out that the effect of price value on behavioural intention is moderated by age and gender. The study further suggests that the consumer technology industry should better design and market technologies to consumers in various demographic groups at various stages of the use curve. Price has also been used in a previous study by Indrawati and Raman (2010) to form a new conceptual model for MMS adoption in Indonesia. Garg and Garg (2011), in their survey of respondents intentions towards usage of 3G mobile services', found out that ease of use was an important factor, but that users were also highly sensitive to price, because they would not willing to use 3G service despite peer pressure if they considered the service to be too expensive or unaffordable.

Research Model

Insight gained from the UTAUT-related models and studies reviewed above informed the inclusion of the following five constructs in a simplified research model for this study: performance expectancy, effort expectancy, social influence, facilitating conditions and price (as predictor variables) and adoption and use of mobile applications (as the dependent variables). Lanzolla and Suarez (2009) suggest that technology use does not necessarily follow from technology adoption such that in many industries, new technologies are sometimes adopted and then used very little or not at all. The research model therefore posits that the four of the variables (i.e. performance expectancy, effort expectancy, social influence, price) would predict adoption of mobile applications measured by download of a mobile application to a mobile device), while prior adoption of mobile applications and/or facilitating conditions or both would predict and determine actual use of mobile applications. This simplified model excludes the moderating variables usually found in the UTAUT models, and this is deliberate in order to focus only on the relationship between the dependent and predictor variables, assuming absence of the moderating variables. Nevertheless, the study recognized the importance of the following elements of facilitating conditions that often promote or constrain use of mobile applications: adequate battery life span and memory space on used mobile devices; adequate access by device users to power supply sources for charging their devices, low cost access to data connections, and adequate knowledge for using mobile applications. The research model is shown in Figure 1 below.

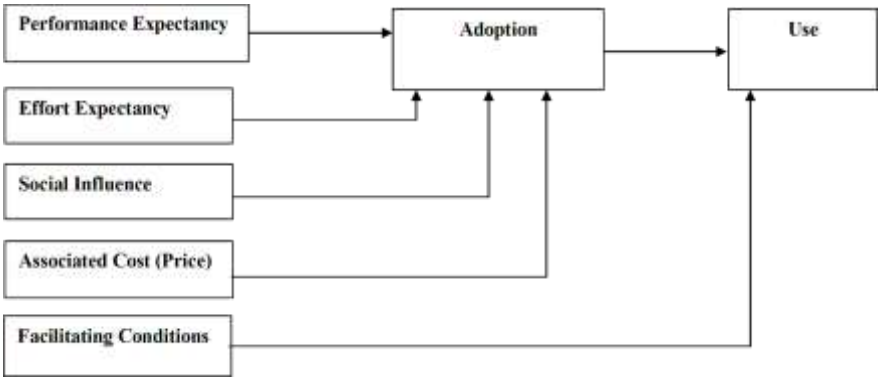

Figure 1: Research model.

Methodology

This study employed the use of descriptive survey to investigate factors that predict adoption and use of mobile applications by the students. The study was undertaken on students in the three of the universities in Oyo State, in South-Western Nigeria: University of Ibadan, Ladoke Akintola University and Lead City University, which are owned by federal government, state government and private sector interests, respectively. Multistage sampling was used to select the universities. Although the study initially intended to sample students from all universities in the state, the fourth university (Ajayi Crowther University, privately owned) was eventually excluded due to the university's inability to release data about its population of students. Next, undergraduate students of the Universities were focused upon because not all the three universities were well established in offering postgraduate courses. Slovin's (1960), formula (as cited in Guilford and Frutcher, 1973) was used to calculate an appropriate sample size that is representative enough to select number of respondents from each university. Convenience sampling was used to select the students that participated in the study based on their accessibility, availability and readiness to participate in the study.

A structured questionnaire was used to collect data in the study. The questionnaire was divided into eight sections with each section measuring and collecting data on respondents' demographics and the seven constructs of the research model. The research instrument was subjected to face by experts in the information science field science at the University of Ibadan where the researchers were based. In order to assess the reliability of the items measuring each of the seven construct variables, a pre-test was carried out and a Cronbach alpha reliability co-efficient of greater than 0.8 was achieved for all variables. Also, a confirmatory Principal Component Analysis of the data collected in the actual survey yielded the benchmark values =>0.60 for all items, which confirmed the reliability of the research instrument. The instrument was administered and data collected personally by the researchers assisted by four research assistants over a period of two weeks. 1,048 out of 1,105 copies of the questionnaire were returned, giving a 94.8% response rate, out of which 1,019 were found suitable for data extraction and analysis.

Results and Discussion of Findings

Table 1 below summarises the gender and age of mobile applications by respondents based on Institution type.

Table 1: Respondents by gender and age characteristics.

Demographic Characteristics		Institution (Type)							
		LAUTECH (State)		Lead City (Private)		University of Ibadan (Federal)		Total	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%
Gender	Male	202	19.82	127	12.46	80	7.66	09	50.00
	Female	163	16.00	157	15.41	90	8.65	10	50.00
	Total	365	35.80	284	27.90	70	6.30	019	100.00
Age	16-20	98	9.40	118	11.31	120	11.51	336	32.20
	21-25	237	22.72	145	13.90	90	8.22	72	54.80
	26-30	32	3.07	24	2.30	62	.94	18	11.30
	Above 30	1	0.10	3	0.29	3	.25	7	1.60
	Total	368	35.30	290	27.80	85	6.90	043	100.00

Research question 1: Which mobile app store is mostly used by the students?

The result of the study as seen on Table 2 shows that the most used mobile app store by the students is the Google Play.

Table 2: Frequency of Use of Mobile App Stores					
Response %					
Usage	*Google Play Store*	*Blackberry App World*	*Nokia Store*	*Apple App Store*	*Others*
Used	52.4	43.9	15.9	10.1	2.1
Not Used	47.5	56.0	84.0	89.9	97.8

Research question 2: Which of the mobile apps is/are mostly used by the students?

Frequency distribution of responses to the question on the most used mobile app in Table 3 shows that *Facebook* app which is under the Social Networking category is the most used among the students (96.1% of respondents). The second most frequently used app is Whatsapp (95.6%) in the same category, while the third most popularly used app is the Dictionary app (90.4%) of the Education category.

Table 3: Specific Mobile Apps used

Mobile Application	*Response (%)*		*Mobile Application*	*Response (%)*	
News	*Used*	*NotUsed*	**Social Network/Instant Messaging**	*Used*	*Not Used*
News24Nigeria	58.6	41.4	Facebook	96.1	3.9
Nigeria News 1	47.3	52.7	Twitter	82.9	17.1
Goal Live Scores	59.5	40.5	Blackberry Messenger	86.9	13.1
Channels TV Mobile	52.3	47.7	Whatsapp	95.6	4.4
Linda Ikeji	60.9	39.1	Yahoo Messenger	82.0	18.0
Sahara Reporters	47.4	52.6	Instagram	71.7	28.3
Punch Mobile	61.2	38.8	Skype	65.5	34.5
BBC News	67.5	32.5	Linkedln	48.9	51.1
CNN News	66.0	34.0	2go	58.8	41.2
News Naij	57.7	42.3	Badoo	42.3	57.7
Games	**Used**	**Not Used**	**Banking**	**Used**	**Not Used**
Clash of Clans	30.6	69.4	GT Bank Mobile	53.0	47.0
Spider Man	44.7	55.3	Access Mobile	22.6	77.4
Zuma	77.3	22.7	Zenith Bank Mobile	15.0	85.0
Temple Run	79.1	20.9	First Monie	25.9	74.1
Fruit Ninja	64.3	35.7	U-Mobile	14.8	85.2
Angry Birds	59.3	40.7	FCMB Mobile	13.0	87.0
Candy Slash Story	50.0	50.0	Wema Mobile	14.0	86.0
Real Football	51.5	48.5	Diamond Mobile	17.3	82.7
Green Farm	39.5	60.5	Sterling Money	13.1	86.9
Sudoku	56.7	43.3	Pocket Moni	16.8	83.2
Health	*Used*	*Not Used*	**Education**	*Used*	*Not Used*
MyFitnessPal	45.5	54.5	Document To Go	56.3	43.7
Sex and Health	59.3	40.7	PDF Reader	74.9	25.1
Blood Pressure Diary	41.1	58.9	Duolingo	29.6	70.4
Woman Calendar	41.8	58.2	Dictionary	90.4	9.6
Body Fitness Guide	54.6	45.4	Bible	80.6	19.4
Fitness Calculator	44.1	55.9	Quran	31.6	68.4

Period Tracker	37.7	62.3		Wikipedia	76.6	23.4
Skin Care Secrets	47.0	53.0		Scientific Calculator	68.7	31.3
Abs Workout	40.4	59.6		Quick Office	54.5	45.5
Recipes from Nigeria	41.7	58.3		Google Translate	58.2	41.8

Research Question 3: What do the students mostly use mobile applications for?
Findings on Table 4 below indicate the responses on most used categories of mobile applications by the students. It was revealed that students mostly use mobile applications for social networking/ instant messaging purposes (97.2%) and least for banking purposes (66.7%).

Table 4: Use of Mobile Apps Categories

Mobile Application Use	*Response (%)*	
Categories of Apps	*Used*	*Not Used*
News	90.7	9.3
Banking	66.7	33.3
Social Networking /Instant Messaging	97.2	2.8
Games	90.1	9.9
Health	81.9	18.1
Education	92.7	7.3

Research Question 4: How often do students use mobile apps?

Findings of the frequency distribution shows that students often use mobile apps in that majority of students (73.5%) use mobile applications every day.

Table 5: Frequency of Use of Mobile Apps

Frequency of use	*Responses (%)*
Once in a week	4.3
2-3 days in a week	9.2
4-6 days in a week	10.6
Everyday	**73.5**
Missing	2.4
Total	100.0

Test of Hypotheses

The level of significance for decision to accept or reject the null hypotheses of the study was set at 0.05.

$H_0$1A: Performance Expectancy, Effort Expectancy, Social Influence or Cost (Price) has no individual significant predictive relationship with adoption of mobile applications by the students.

The results in Table 6 below show an averagely positive significant relationship of performance expectancy (β=0.491), effort expectancy (β=0.550), social influence (β=0.502) but weak positively significant relationship between price (β=0.387) and adoption of mobile applications. The values of the adjusted R^2 further revealed that performance expectancy, effort expectancy, social influence and price individually explains about 24.0%, 30.2%, 25.1% and 14.9% of the variance in adoption of mobile applications, respectively.

Table 6: Prediction of Adoption of Mobile Applications individually by Performance Expectancy, Effort Expectancy, Social Influence, Price

Dependent Variable: Use of Mobile application	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Model 1 *(Predictor variable:* Performance Expectancy*)*					
(Constant)	1.769	.086		20.669	.000
Performance Expectancy	.421	.025	.491	17.049	.000
Notes: N= 918; df =1; F ratio = 290.674; R = 0.491; R^2 = 0.241; Adjusted R^2 = .240					
Model 2 *(Predictor variable:* Effort Expectancy*)*					
(Constant)	1.560	.084		18.602	.000
Effort Expectancy	.505	.025	.550	19.929	.000
Notes: N= 916; df =1; F ratio = 397.146; R = 0.550; R^2 = 0.303; Adjusted R^2 = .302					
Model 3 *(Predictor variable:* Social Influence)					
(Constant)	1.820	.080		22.744	.000
Social Influence	.453	.026	.502	17.590	.000
Notes: N= 918; df =1; F ratio = 309.412; R = 0.502; R^2 = 0.252; Adjusted R^2 = .251					
Model 4 *(Predictor variable:* Price)					
(Constant)	2.356	.067		34.970	.000
Price	.308	.024	.387	12.867	.000
Notes: N= 941; df =1; F ratio = 165.560; R = 0.387; R^2 = 0.150; Adjusted R^2 = .149					

$H_0$1B: Performance Expectancy, Effort Expectancy, Social Influence and Cost (Price) have no joint significant predictive relationship with Adoption of mobile applications by the students.

Table 7 below shows that the model that includes all the four predictor variables simultaneously is significant in predicting adoption of mobile applications by the students ($F_{(4,873)}$ = 150.265; p = 0.000). The significance (i.e. < 0.05) of the t statistic for the individual predictor variables shows that each of them contribute in predicting adoption of mobile applications. Additionally, the Beta statistics for the predictor variables show that Effort Expectancy is the strongest among the predictors (Beta = 0.350), followed in order by Price (Beta = 0.194), Social Influence (Beta = 0.169) and Performance Expectancy (Beta = 0.101). Finally, the Adjusted R^2shows that the model (which includes all four predictor variables) accounted for 40.6% of the total variance in adoption level.

$H_0$2A: Adoption or Facilitating Conditions has no individual significant predictive relationship with Use of mobile applications by the students.

The results in Table 8 shows, firstly a weak but significant relationship between adoption of mobile applications (evidenced by selection and download of applications)and actual use of mobile applications (Beta =0.193). The table also shows a similarly weak but significant relationship between facilitating conditions and actual use of mobile applications(Beta = 0.087).The adjusted $R^2$for the separate models further revealed that adoption and facilitating conditions individually explains only about 4% and 1% variance in adoption of mobile applications respectively.

Table 7: Prediction of Adoption of Mobile Applications jointly by Performance Expectancy, Effort Expectancy, Social Influence, Price

Dependent Variable: Adoption of Mobile applications	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Predictor variables:					
Constant	1.001	.092		10.909	.000
Performance Expectancy	.086	.032	.101	2.724	.007
Effort Expectancy	.320	.033	.350	9.644	.000
Social Influence	.152	.033	.169	4.667	.000
Price	.152	.022	.194	6.790	.000
Notes: N= 873; df =4; F ratio = 150.265; R = 0.639; R^2 = 0.409; Adjusted R^2 = 0.406					

Table 8: Prediction of Use of Mobile Applications separately by Adoption of Mobile Applications and Facilitating Conditions

Dependent Variable: Use of Mobile application	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Model 1 *(Predictor variable:* Adoption of mobile applications*)*					
(Constant)	2.695	.147		18.311	.000
Adoption	.272	.045	.193	6.002	.000
Notes: N= 936; df =1; F ratio = 36.024; R = 0.193; R^2 = 0.037; Adjusted R^2 = .036					
Model 2 *(Predictor variable:* Facilitating conditions)					
(Constant)	3.224	.130		24.753	.000
Facilitating Conditions	.119	.044	.087	2.673	.008
Notes: N= 933; df =1; F ratio = 7.144; R = 0.087; R^2 = 0.008; Adjusted R^2 = .007					

$H_0$2B: Adoption and Facilitating Conditions have no joint significant predictive relationship with Use of mobile applications by the students.

The result of the analysis as shown in Table 9 below shows that the model is significant for predicting use of mobile applications ($F_{(2,915)}$ = 17.221; p = 0.000) by the students, with a weak but positive and significant relationship between adoption of and actual use of mobile applications (Beta = 0.192), and a weak negative but insignificant relationship between facilitating conditions and actual use of mobile applications by the students (Beta = -0.003). The Adjusted R^2 showed that the model (which includes both variables) accounted for a mere 3% of the variance in use of mobile applications.

Table 9: Joint Prediction of Use of Mobile Applications by Adoption and Facilitating Conditions

Dependent Variable: Use of Mobile application	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Predictor Variables:					
(Constant)	2.700	.164		16.437	.000
Adoption	.273	.052	.192	5.244	.000
Facilitating Conditions	-.004	.050	-.003	-.088	.930
Notes: N= 915; df =2; F ratio = 17.221; R = 0.191; R^2 = 0.036; Adjusted R^2 = 0.034					

Discussion

The frequency distribution performed on use of mobile apps shows that Google Play remains the most used mobile app store among all the stores surveyed. This is similar to Mobile App Statistics (Louis, 2013) that shows Google Play to have higher number of users than other apps compared with, and Bowen and Pistilli (2012) findings that smartphones that operate on Android platform dominates students device ownership. Also, Facebook remains the most used mobile app among all the applications surveyed. This supports Google play statistics by Irving (2014) that revealed Facebook as the most downloaded social networking app in the year and also by Mashable (2015) as the world's largest social network with more than 1 billion users. Findings of Olowu and Seri (2012) also revealed Facebook as the most used social network among youths in Nigeria.

This study also found out that students mostly use mobile applications for social networking/ instant messaging purposes. This result conforms to Chen and deNoyelles (2013) finding that shows social networking as the most popular app category among students. The study of Olowu and Seri (2012) also confirmed that youths use social networks often. In addition, Park, Yang and Lehto (2007) findings showed that users of mobile devices use it mostly for voice and instant messaging which have the highest percentage of usage purpose in respect to other purposes in the study. This study therefore agrees with the conclusion of Chen and deNoyelles (2013) that college students use their mobile devices mostly for self-directed informal learning rather than in the formal academic context but however disagree with Bosomworth (2014) that shows that people mostly use their mobile phones for games. The frequency distribution result shows that majority of students use mobile applications every day. This is similar to Bowen and Pistilli (2012) that found that students spent more time using mobile apps.

Summarily, the results of the tests of hypotheses $H_0$1B and $H_0$2B provides the validated research model shown in Figure 2.

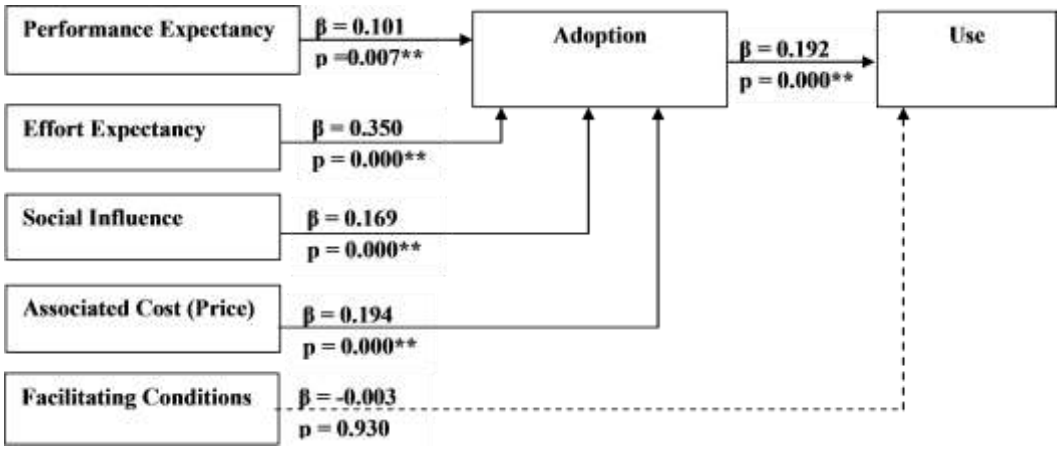

Figure 2: Validated Research Model

Performance expectancy, effort expectancy, social influence and cost (price) all had significant relationship with adoption of mobile applications. This implies that students in general perceived mobile applications as relevant in making useful contributions to their productivity. Also, they agreed to the ease of use of mobile apps as a relevant factor and consider the importance of others in adoption of mobile apps. Furthermore, the mobile apps used by the students are determined by the price as the students agreed to pay for paid apps only on special occasions. These are in consonance with findings of previous research. While Oluwole (2012) showed that performance expectancy had significant influence on smartphone adoption and use, Park *et al*. (2007) found that performance expectancy significantly influence attitude towards using mobile technologies. Lownthal (2010), Venkatesh*et al*. (2012) and Abu-Al-Aish and Love (2013) also found that performance expectancy influence

behavioural intention towards use. The more students perceived that mobile apps help them attain their goals, the more likely they adopt and use these devices. This assertion is similar to Marumbwa and Mutsikiwa (2013) that says the higher the perceived usefulness, the more likely consumer adopt mobile money services.

The significant relationship revealed between effort expectancy and mobile apps adoption is consistent with Lee *et al*. (2012) who found that effort expectancy was significant in influencing the use of smartphone applications. Also, in support of Park *et al*. (2007) findings that effort expectancy significantly influence attitude towards using mobile technologies, Lownthal (2010), Abu-Al-Aish and Love (2013) and Bankole *et al*. (2011) also showed that effort expectancy influence intention to use mobile technology. The result of Pitchayadejanant (2011) however did not go in line with these studies in revealing that effort expectancy has no significant relationship with intention. The degree to which the students believe that using mobile apps will be free of effort determines the adoption of the mobile applications. This assertion is similar to Marumbwa and Mutsikiwa (2013) that says the greater the perceived ease of use, the more likely consumer adopt mobile money services.

The study revealed that social influence had significant relationship with adoption of mobile applications. The findings of this study indicate that people who are important to the students influence their use of mobile applications through their encouragement and advices that use of mobile apps is a good idea and would probably help them in achieving their tasks as a student. This finding contradicts the findings of Oluwole (2012) and Pitchayadejanant (2011) who found that social influence was not significant on smartphone adoption and intention to use; and also with Lee *et al.* (2012) who found that social influence was insignificant among the factors affecting smartphone applications acceptance. Bankole*et al*. (2011) also agreed that intention towards use of mobile banking technology in Nigeria is not affected by social factors. However, the findings of this study agreed with that of Park *et al*. (2007) who found social influence significant in affecting technology adoption and use.

In adopting mobile applications by students, the price factor cannot be underestimated. The findings of this study revealed that associated cost (price) of downloading a mobile application had significant relationship with adoption of mobile applications. This is similar to findings of Garg and Garg (2011) that identified price as extremely important factor that determines use of 3G mobile services. Zhou (2011) also indicated that usage cost significantly affect users' satisfaction, further determining their post adoption behaviour. This can be confirmed by the second research question which shows that a free app is the most used because students only pay for mobile apps they are in dire need of if the price is not high or believe that the benefits are more than the price.

The regression analysis carried out in the study to test for individual relationship between use of mobile applications and each of adoption and facilitating conditions showed that both relationships were significant. However, the test of joint predictive relationship of both with use of mobile applications revealed adoption as sole significant predictor of use. Some previous studies (Park *et al.*, 2007; Oluwole, 2012 and Lee *et al.*, 2012) have found that facilitating conditions do not have a significant influence on smartphone adoption and use, acceptance of smartphone applications and attitude towards using mobile technologies; however, Wu *et al*. (2008) and Pitchayadejanant (2011) found out that facilitating conditions have significant effect on technology adoption and intention of use. The reason for the non-significance of facilitating conditions in the same model with adoption in the present study is likely that adoption (i.e. prior download and installation) of a mobile application is itself an aspect of facilitating conditions. Therefore, the influence of facilitating conditions may not be strong in the model once mobile applications have already been adopted. Furthermore, this study indicates that students who adopt mobile applications to satisfy both academic and non-academic purposes actually use the apps.

Conclusion

The importance of use of mobile applications in students' academic lives cannot be overlooked. This is because according to Chen and deNoyelles (2013), mobile technologies are playing important role

in college students' academic lives. This study has used an adapted UTAUT model as research framework to study the level of adoption and use of mobile applications among University students and found that mobile apps is a frequent phenomenon among the students. Findings have also shown that performance expectancy, effort expectancy, social influence and price are critical factors that predict adoption of mobile apps and users who adopt these apps actually use them to satisfy their academic and non-academic goals. This study has been able to contribute to knowledge on mobile application adoption and use among students by establishing factors determining their adoption and use thereby providing relevant information that can assists mobile apps developers and stakeholders in the Education sector in becoming well informed about mobile technology adoption and use before investments are made. The study has added to limited literature as indicated by Böhmer, Hecht, Schöning, Krüger, and Bauer (2011) that little public information exists on mobile application usage behaviour.

Having studied the factors predicting adoption and use of mobile applications by students of the representative types of Institutions in Nigeria (state, private and federal), the following are therefore recommended:

- Institutions should also encourage the use of mobile applications for formal learning.
- Mobile app developers should develop free educational mobile applications that will be readily available for students' use.
- Local mobile app developers should increase their marketing and advertising strategies for students to increase students' awareness and use of locally produced mobile apps.
- Mobile apps for the students should take into consideration the mobile app stores mostly used and such apps should be made downloadable from the stores.
- Hardware manufacturers should produce devices that have long battery life span to encourage more use of mobile applications.

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