Determinants of Smartphone Health Applications Utilization among Students in University of Lagos

Habeeb L. Owolabi[1], Modinot F. Amusa[2]& Barakat O. Adekanmbi[3]
Department of Human Kinetics and Health Education[1,2,3]
University of Lagos, Nigeria.
hablad@yahoo.com[1],medinahadefunke@gmail.com[2],badekanmbi@unilag.edu.ng[3]
Corresponding author: hablad@yahoo.com, 08138456825

Abstract

The use of Smartphone has become universal with little attention paid to health applications by phone users. Health applications on Smartphones are downloaded from various stores to inculcate positive health attitudes for an individual's wellbeing. The study investigated the determinants of Smartphone health applications utilization among University of Lagos students, Nigeria. The study was guided by four null hypotheses. The study adopted a descriptive survey research design. The population of the study included all undergraduate students at the University of Lagos. The sample of the study constituted three hundred (300) respondents while simple random sampling and purposive sampling techniques were used. The instrument used for data collection was a validated questionnaire with a reliability of r= 0.92. Chi-square statistical analysis was used for data analysis. The finding of the study revealed that technical knowledge, awareness, student field of study and attitude of students have a significant influence on the utilization of Smartphone health application. Local mobile app developers should increase their marketing and advertising strategies for students to increase students' awareness, mobile apps should be designed in such a way that the field of study should be taken into consideration and hardware manufacturers should produce devices that have a long battery life span to encourage a positive attitude of the students towards the use of mobile health applications

Keywords: Application, Health, Smartphone, Student, University, Utilization

Introduction

The use of Smartphone has become universal. It offers advanced technologies with functionality similar to a personal computer which is used for various purposes such as the abilities to place and receive voice calls, create and receive text messages, with those of other popular digital mobile devices like personal digital assistants (PDAs), such as an event calendar, media player, video games, GPS navigation, digital camera and digital video camera. According to AbuSaleh, Illhoiand Lincoln(2012), Smartphone is a new technology that combines mobile communication and computation in a handheld-sized device, facilitating mobile computing at the point of care. A comprehensive study was carried out by Becker (2016) and it was found that health applications assist patients in taking their medications as prescribed. Smartphones can access the Internet and can run a variety of third-party software components such as applications from places like Google Play Store or Apple App Store. Application is downloaded to carry out various functions like Flo Period & Ovulation Tracker for Period tracking, accurate predictions of ovulation period and personal health notes for a positive lifestyle change. Some other apps are Drink water reminder to track water habits, My Eyes Protection to prevent eye sprain, Healthy Eating Habits app and Quit smoking apps.

The healthcare system is highly mobile, involving multiple clinical locations such as clinics, inpatient wards, outpatient services, emergency departments, operating theatres, intensive care units (ICUs), and laboratories. (Ammenwerth, Buchauer, Bludau & Haux, 2000; Banitsas, Georgiadis, Tachakra & Cavouras 2004; Bardram, 2005; Bardram & Bossen, 2005). As such, working in the healthcare system requires extensive mobility of healthcare professionals as well as communication and collaboration among different individuals, including their colleagues and patients. Healthcare professionals mainly used pagers for mobile communication until the wide availability of cell phones in the 1990s (Burdette, Herchline & Oehler). The advent of mobile Personal Digital Assistants (PDAs) during the 1990s enabled healthcare professionals to organize their contacts and calendars electronically, adding another device in their pockets. The combined functionality of a pager, a cell phone and a PDA is now replaced by a single device called a "smartphone", which is becoming very popular among healthcare professionals as well as the general public (Wu, Morra, Quan, Lai, Zanjani, Abrams & Rossos, 2010).

Smartphone technology and health applications are transforming health promotion. Smartphones are mobile devices with additional capabilities such as email, text messaging, video viewing, and wireless Internet access (Fukuoka, Komatsu & Suarez, 2011). Sherwood-Smith & Pritchard-Jones (2012) explained that applications, or apps, are downloadable software products that run on mobile devices. The emerging health technologies support the Healthy

People 2020 Health Communication and Information Technology goals and objectives which include the increased use of mobile devices to improve health outcomes and health quality and achieve health equity (USDHHS, 2010).

According to Riley, Rivera and Atienza (2011), Smartphones are small, always-on, and carried on the person during the day. Smartphones, with the potential to outnumber personal computers shortly, are owned by 40 to 50% of Americans, and their use continues to grow (Sarasohn-Kahn, 2010; Peskin, 2010). Smartphones run over wireless communication networks and open operating platforms such as iPhone OS, BlackBerry OS, and Android (Sarasohn-Kahn, 2010). Interestingly, the 55- to 64-year old age cohort was the fastest-growing age group for smartphone adoption in 2011 with an increase in use from 17% to 30%. Many developing countries have even skipped mainframe computer development and moved directly to mobile broadband and smartphones to meet their computing infrastructure needs (Dolan, 2012).

Recent years have witnessed and embraced the utilization of Smartphones for the consumption of health products and services. The services of these gadgets are being patronized by health care professionals, people in the academic arena and the wide range of the public. The most common store where these applications are gotten from is Google play store on Android phones and Apple store on iPhones which include applications that could lead to positive health-seeking behaviours such as Flo Period & Ovulation Tracker for Period tracking, accurate predictions of ovulation period and personal health notes for a positive lifestyle change. Some other apps are Drink water reminder to track water habits, My Eyes Protection to prevent eye sprain, Healthy Eating Habits app and Quit smoking apps amongst others. The majority of these applications are always for free which had been standardized under registered organizations.

According to Becker (2016), patients typically use health apps when they are alone at home. Not everyone can operate them as they have a hard time with it. The extent of utilization of the apps and determinants for utilization of Smartphone health applications is not known, it is on this basis that the researcher investigated determinants of Smartphone health applications utilization among University of Lagos students, Nigeria.

Research Hypotheses

The following hypotheses were tested in this study:

1. Knowledge of students will not significantly influence the utilization of Smartphone health applications
2. Awareness of students will not significantly influence the utilization of Smartphone health applications
3. Student field of study will not significantly influence the utilization of Smartphone health applications
4. Attitude of students will not significantly influence the utilization of Smartphone health applications

Methodology

The descriptive survey research method was adopted for this study. The population for this study included all students at the University of Lagos. The population of students was 31,408 at the 2017/2018 Academic session. They were considered relevant to the study as they were directly involved with the use of Smartphones under study. The sample comprised three hundred (300) respondents drawn from the University of Lagos. The population and sample distribution are shown below:

Table 1: Unilag Pocket Statistics 2017/2018

S/N	Faculty	Female	Male	Total
1	Arts	1925	1182	3107
2	Basic Medical Sciences	318	222	540
3	Clinical Sciences	664	394	1058
4	Dental Sciences	197	212	409
5	Education	3154	2106	5260
6	Engineering	580	2795	3375
7	Environmental Sciences	414	1256	1670
8	Law	1233	635	1868
9	Management Sciences	2176	2289	4465
10	Pharmacy	448	270	718
11	Science	2352	2811	5163
12	Social Sciences	1992	1783	3775
	Total	15453	15955	31408

Source: University of Lagos (2020)

Table 2: Sample Distribution

S/N	Faculty of Education	Faculty of Science	Faculty of Engineering	Total Sample
1	Arts & Social Science Education	Chemistry	Chemical Engineering	75
2	Educational Administration	Mathematics	Electrical & Electronics Engineering	75
3	Human Kinetic & Health Education	Biochemistry	Metallurgy & Materials Engineering	75
4	Science & Tech. Education	Cell Biology & Genetics	Systems Engineering	75
	100	100	100	300

Source: Researcher, 2018

The sampling technique adopted was a simple random and purposive sampling technique. This was carried out using a simple random sampling technique to select three (3) faculties out of twelve at the University of Lagos. Stratified sampling technique was used to select four (4) Departments from the selected faculties while purposive sampling technique was used to administer the research instrument to university students that are present at the time of distribution and are willing and ready to participate within their various faculties. The research instrument for this study was a self-developed structured questionnaire. The instrument contained two sections A and B, Section A consisted of the personal information of the respondents while B seek information on the sub-variables of determinants of smartphone health application utilization selected for the study. Section B contained 24-item questions. The questionnaire was rated according to a modified four (4) – point Likert format of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). This enabled the respondents to indicate the extent of agreement or disagreement to the stated item.

To ensure content and face validity of the instrument, the research instrument was validated with the assistance of the experts in the Department of Human Kinetics and Health Education, the University of Lagos during which necessary corrections, modifications and suggestions will be incorporated before the administration of the instrument. The reliability of the instrument was 0.92 which indicated a strong positive reliability level.

The questionnaire was administered by the researchers to the respondents within the school environment and was collected back immediately after filling to avoid loss of questionnaire. Assurance was given that the data collected from the respondents was only for research purposes. Names were not required but every information was to be honestly responded to and it was highly appreciated as they responded accordingly. Three hundred (300) copies of the questionnaire were administered and retrieved from the respondents. Administration and retrieval of a questionnaire in the institutions lasted for 2 months within school hours.

The data from this study were subjected to appropriate statistical analysis. Section A was analysed using descriptive statistics of frequency count and percentage while inferential statistics of chi-square was used to analyse the hypotheses at a 0.05 level of significance.

Results
Demographic Data

Table 3a: Analysis of Demographic Data of the Participants

Age	**N**	**%**
16-20	89	29.7
21-25	154	51.3
26-30	42	14
31 and above	15	5
Total	**300**	**100**
Gender		
Male	143	47.7
Female	157	52.3
Total	**300**	**100**
Level		
100L	81	27
200L	47	15.7
300L	93	31.6
400L	35	11.7
500L	19	6.3
600L	23	7.7
Total	**300**	**100**
Occupation of Father		
Self-employed	54	18
Private sector	132	44
Public sector	66	22
Unemployed	48	16
Total	**300**	**100**

The table 3a above reveals the demographic data of the participants, 89(29.7%) of the total participants were within the age of 16-20, 154(51.3%) within the 21-25 years, 42(14%) within 26-30 and 15(5%) were within 31 years and above. Hence, this shows that large numbers of the participants were within 21-25 years of age. Likewise, 143(47.7%) male participated in the study and 157(52.3%) were female. It also shows the levels of the participants, 81(27%) of the participants were in 100L, 47(15.7%) are in 200L, 97(31.6%) were in 300L, 35(11.7%) were in 400L, 19(6.3%) were in 500L, and 23(7.7%) were in 600L. This reveals that the majority of participants are in 300L. Participants father are engaged in a various occupation, 54(18%) were self-employed, 132(44%) work in private companies, 66(22%) work in public companies, and 48(16%) were unemployed.

Table 3b: Analysis of Demographic Data of the Participants

Occupation of Mother	**N**	**%**
Self-employed	103	34.3
Private sector	93	31
Public sector	74	24.7
Unemployed	30	10
Total	**300**	**100**
Types of Resident		
Hostel	112	37.3
Living outside (my own)	147	49
Living with my parent	41	13.7
Total	**300**	**100**

In the same vein, said that 103(34.3%) of their mothers are self-employed, 93(31%) worked with private companies, 74(24.7%) work with public companies and 30(10%) were unemployed. Also, 112(37.3%) of the participants stale on hostels, 147(49%) lived outside the campus in their apartment, while 41(13.7%) often come from home (where they live with their parent).

Table 4: Smartphone Operating System

S/N	List	Responses	%
1.	Android OS (Google inc)	89	29.7
2.	Bada (Samsung Electronics)	54	18
3.	Blackberry OS (research in motion)	35	11.7
4.	iPhone OS/iOS (Apple)	23	7.7
5.	MeeGo OS (Nokia and Intel)	47	15.7
6.	Palm OS (Garnet OS)	18	6
7.	Symbian OS (Nokia)	8	2.7
8.	Web OS Palm /HP)	11	3.7
9.	Windows Mobile (Windows Phone)	15	5
	Total	**300**	**100**

Table 4 above reveals the types of phone students used, 89(29.7%) used Android OS (Google inc) enabled phones, 54(18%) uses Bada (Samsung Electronics) enabled, 35(11.7%) uses Blackberry OS (research in motion) phones, 23(7.7%) uses iPhone OS/iOS (Apple), 47(15.7%) used MeeGo OS (Nokia and Intel), 18(6%) uses Palm OS (Garnet OS), 8(2.7%) used Symbian OS (Nokia), 11(3.7%) uses Web OS Palm /HP, 15(5%) uses Windows Mobile (Windows Phone).

Testing Hypotheses

Hypothesis 1

Knowledge of students will not significantly influence the utilization of Smartphone health application

Table 5: Knowledge of students and utilization of Smartphone health application

Variables	N	DF	L.S	x-cal	x-tab	Decision
Knowledge of students and utilization of Smartphone health application	300	3	0.05	26.74	7.82	Ho rejected

P<0.05

From table 5, the calculated value (x-cal) is 26.74 and this is greater than the table valve (x-tab) of 7.82, which informed the rejection of the null hypothesis which states that: Knowledge of students will not significantly influence the utilization of Smartphone health application. Therefore, the knowledge of students will significantly influence the utilization of Smartphone health application.

Hypothesis 2

Awareness of students will not significantly influence the utilization of Smartphone health application

Table 6: Awareness of students and utilization of Smartphone health application

Variables	N	DF	L.S	x-cal	x-tab	Decision
Awareness of students and utilization of Smartphone health application	300	3	0.05	10.58	7.82	Ho rejected

P<0.05

From table 6, the calculated value (x-cal) is 10.58 and this is greater than the table valve (x-tab) of 7.82, which informed the rejection of the null hypothesis which states that: Awareness of students will not significantly influence the utilization of Smartphone health application. Thus, the Awareness of students will significantly influence the utilization of Smartphone health application.

Hypothesis 3

Student field of study will not significantly influence the utilization of Smartphone health application

Table 7: Student field of study and utilization of Smartphone health application

Variables	N	DF	L.S	x-cal	x-tab	Decision
Student field of study and utilization of Smartphone health application	300	3	0.05	27.12	7.82	Ho rejected

P<0.05

From table 7, the calculated value (x-cal) is 27.12 and this is greater than the table valve (x-tab) of 7.82, which informed the rejection of the null hypothesis which states that: Student field of study will not significantly influence the utilization of Smartphone health application. Thus, the Student field of study will significantly influence the utilization of Smartphone health application.

Hypothesis 4

An attitude of students will not significantly influence the utilization of Smartphone health application

Table 8: Attitude of students and utilization of Smartphone health application

Variables	N	DF	L.S	x-cal	x-tab	Decision
An attitude of students and utilization of Smartphone health application	300	3	0.05	31.56	7.82	Ho rejected

P<0.05

From table 8, the calculated value (x-cal) is 31.56 and this is greater than the table valve (x-tab) of 7.82, which informed the rejection of the null hypothesis which states that: Attitude of students will not significantly influence the utilization of Smartphone health application. Thus, the Attitude of students will significantly influence the utilization of Smartphone health application**.**

Discussion of Findings

The results of the first hypothesis of this study reveal that knowledge of students will significantly influence the utilization of Smartphone health application. Hypothesis one which says that knowledge of students will not significantly influence the utilization of Smartphone health application is rejected and the alternate is accepted. This study supports the findings of According to Hakoama & Hakoyama (2010), there has been quite an enormous amount of popularity of cellular/ smartphones in youngsters' generation within a short period. Youth and students are more versatile in the sense of smartphones, therefore, making their use and access more interesting.

The results of the second hypothesis of this study reveal that Awareness of students will significantly influence the utilization of Smartphone health application. Hypothesis two which says that students will not significantly influence the utilization of Smartphone health application is rejected and the alternate is accepted. This study supports the findings of Elogie, Ikenwe and Idubor (2015), who opined that smartphones will presumably allow students to have immediate access to information, communication applications, the ability to shop online, mobile banking and entertainment.

The results of the third hypothesis of this study reveal that the Student field of study will significantly influence the utilization of Smartphone health application. Hypothesis three which says that the Student field of study will not significantly influence the utilization of Smartphone health application is rejected and the alternate is accepted. This study supports the findings of Kohe and Wan (2014), they aver that there are medical apps perceived by medical students to help improve their clinical decision making which also saves time, allows fast access to natural clinical practice guidelines, allow faster access to common laboratory reference values, help in making differential diagnosis, enable useful medical-related calculation, allow faster accesses to a reliable source of knowledge. For his part, Bruce (2010), opines that medical students can also use smartphones to access links, relevant websites, videos, course materials and also access course materials so that students can learn at a convenient time and place. Rabiu,

Muhammed, Umaru and Ahmed (2016) submit that internet/ smartphone access has exposed many medical students to different kinds of contents.

The results of the fourth hypothesis of this study reveal that the Attitude of students will significantly influence the utilization of Smartphone health application. Hypothesis four which states that the Attitude of students will not significantly influence the utilization of Smartphone health application is rejected and the alternate is accepted. This study supports the findings of Taylor and Harper (2013), who portray that smartphones and their use have a special place and impact on student life and academic performance especially.

Conclusion

From the findings of this study, it was concluded that:

The availability of Smartphone and health applications among students did not expose students to consistent utilization of health applications on their gadgets. This could be as a result of a lack of knowledge, awareness and inability to see opportunities in the utilization of these apps irrespective of the field of study.

Adequate health education on the utilization of health behavioural change application would at the large influence the utilization of these smartphone health applications and also motivate the adherence to the instructions of the applications thereby reducing the problems of diseases especially cardiovascular diseases such as obesity, hypertension,

Recommendation

Based on the findings of the study, the following recommendations were suggested:

1. Mobile app developers should develop free educational services to students most especially the computer science, science and technology education and health education department of the university to provide technical knowledge to the students to encourage utilization of mobile health applications.
2. Local mobile app developers should increase their marketing and advertising strategies for students to increase student's awareness and use of locally produced mobile apps.
3. Mobile apps should be designed in such a way that the field of study should be taken into consideration. The mobile app stores should be made downloadable from the stores. There should be deliberate periodic advancement of smartphones for better performance.
4. Hardware manufacturers should produce devices that have a long battery life span to encourage a positive attitude of the students towards the use of mobile health applications.

References

Abu Saleh, M. M.**,** Illhoi, Y., &Lincoln, S. (2011). A systematic review of healthcare applications for smartphones. Retrieved from http://www.biomedcentral.com/1472-6947/12/67

Ammenwerth, E., Buchauer, A., Bludau, B, & Haux, R. (2000). Mobile information and communication tools in the hospital. *International Journal of Medical Informatics*, 57, 21-40.

Banitsas, K. A., Georgiadis, P., Tachakra, S., & Cavouras, D. (2004).Engineering in Medicine and Biology Society. 2nd edition. San Franscisco, CA: IEEE: IEMBS'04. 26th Annual International Conference of the IEEE; 2004:3105-3108.

Bardram, J. E. (2005). Activity-based computing: support for mobility and collaboration in ubiquitous computing. *Personal and Ubiquitous Computing*, 9, 312-322.

Bardram, J. E., & Bossen, C. (2005). Mobility work: The spatial dimension of collaboration at a hospital. *Computer Supported Cooperative Work (CSCW)*, 14, 131-160.

Burdette, S. D., Herchline, T. E., & Oehler, R. (2008). Practising medicine in a technological age: Using smartphones in clinical practice. *Clin Infect Dis*, 47, 117-122.

Dolan, B. (2012). 12 trends for mobile health in 2012. Retrieved from: http://mobihea lthnews.com/16310/12-trendsfor-mobile-health-in-2012/#more-16310.

Fukuoka, Y., Komatsu, J., & Suarez, L., (2011). The mPED randomized controlled clinical trial: Applying mobile persuasive technologies to increase physical activity in sedentary women protocol. *BMSPublic Health.11*(1), 933.

Peskin, S. (2010). Is the mobile health revolution made for managed care? Managed Care. Retrieved from: http://www.managedcaremag.com/archives/1012/1012.mobile.html.

Riley, W., Rivera, D., & Atienza, A. (2011). Health behaviour models in the age of mobile interventions: Are our theories up to the task? Translational Behavioural Medicine Practice, Policy, Research. Retrieved from: http://www.springerlink.com.proxy.lib.pdx.edu/content/ i963 583533g56088/fulltext.pdf.

Sarasohn-Kahn, J. (2010). How smartphones are changing health care for consumers and providers. California HealthCare Foundation. Retrieved from: http://www.chcf.org/ publications/2010/04/how smartphones-are-changing-health-care-for-consumers-and-providers.

Sherwood-Smith, J., & Pritchard-Jones, R. (2012). Medical applications: The future of regulation. *Ann R Coll Surg Engl. 94*, 12-13.

University of Lagos (2020). Unilag pocket statistics 2017/2018. Retrieved from https://library.unilag.edu.ng/library-news/item/22-university-of-lagos-2017-2018-pocket-statisitics

USDHHS (2010). Healthy people 2020. Health communications and health information technology objectives. Washington, DC, 2010. Retrieved from: http://www.healthypeople. gov/2020/topicsobjectives2020/objectives list.aspx?topicid=18.

Wu, R. C., Morra, D., Quan, S., Lai, S., Zanjani, S., Abrams, H., & Rossos, P. G. (2010). The use of smartphones for clinical communication on internal medicine wards. *J Hosp Med*, *5*,553-559.