

UNDERGRADUATES' USE OF SMARTPHONES FOR ACCESSING LIBRARY MATERIALS AND SERVICES IN SELECTED ACADEMIC LIBRARIES IN SOUTH WEST NIGERIA

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ABSTRACT

This study examined undergraduates' use of smartphones for accessing library materials and services in selected academic libraries in South West Nigeria. A survey approach was adopted that focused on undergraduate students as the target population. Four research questions were developed and answered. The findings revealed that an Android phone is the type of smartphone used by undergraduate students for accessing materials and services. Visual materials, reference materials, databases, maps, and atlases are the basic categories of library materials undergraduates access through smartphones. Reference service is the most accessible service by undergraduate students through their smartphones followed by circulation service and the online public access catalogue. Use of smartphones to access library materials enables quick access to information, offers solutions to problems, and enables immediate and timely submission of assignments. Undergraduates prefer using a smartphone for accessing library materials and services because it saves time compared to visiting the library and is stress-free and allows quick access to materials and services. The findings also demonstrated that gender, age, and year/level of study significantly influence the use of smartphones for accessing library materials and services by undergraduate students. The problems associated with accessing library materials and services through smartphones are expensive phone subscriptions, network and internet access issues, the high cost of smartphones, and phones distract students from working.

Keywords: mobile technologies, learning, access, smartphones, cell phones, library materials, library services, academic libraries.

INTRODUCTION

A smartphone is a subdivision of a more general and overall term known as mobile device. Dresselhaus and Shrode (2012) aptly define mobile devices as essentially any device that someone uses. There are different types of mobile phones available in today's global society ranging from smartphones, PDAs, camera phones, to multimedia

phones and touchscreens, with some relationship existing among them. Mobile devices such as laptops, palmtops, notebook computers, cell phones, tablets, iPods, audio and video players, and others can be activated in libraries and put into full usage to access library materials with the assumption that almost every student in Colleges of Education, Polytechnics, and Universities have

a mobile device connected to the internet. As pointed out by Walsh (2012), in 2011 mobile data traffic was eight times the size of the global internet in 2000, and it was projected that mobile devices will outnumber human beings. This data shows the influence and wide coverage that mobile devices have in the information world of today.

It is projected that at least one out of four people own a smartphone, i.e., a phone that has internet access. The use of the term “smartphone” has become popular to identify devices that have internet functionalities that are similar to personal computers. This implies that smartphones have gained popularity all over the world, as they now play an integral role in the everyday life of their users. The smartphone also helps people connect with one-another and the internet. According to research carried out by internet experts, it has been hypothesized that by 2020 smartphones will be the primary connection tool for most people in the world (Starkweather & Stowers, 2009). Most smartphones make use of wireless mobile networks (Edge, 3G, 4G, and even 5G) and offer email, internet services, and advanced call features as well as (in most cases) a full QWERTY keyboard, either with a physical keyboard attached to the device or one embedded into the operating system.

A smartphone is a portable, full-fledged computer or device that offers advanced and sophisticated PC-like capabilities that take the device beyond phone calls and SMS messages. Smartphones are wireless transmission devices that can receive and transmit via digital or analogue shortwave (Rouse, 2007). The smartphone is a general term for the kind of phone that has an independent operating system like a PC and can connect with wireless networks through mobile communications networks (Baik, 2013). The main distinguishing feature between a mobile phone and a smartphone is that the latter is a mobile phone that offers more cutting-edge computing ability and connectivity than a contemporary phone with basic features. Smartphone technology has made communication and access to information very convenient and timely for users, whether from the comfort of their households and offices or while they are on the move using their cellular phones or the personal digital assistants (PDAs) (Batool & Asghar, 2012). The device enables users to access information without being limited to a certain place or a specific time (Aharon, 2013).

There is a wide range of features and functions available for today's smartphone. Some of these features are preinstalled on the phone itself, while others may be added. It is important to note that, although these features are greatly dependent on the phone's built-in capabilities, they also vary according to the mobile preferences of the users. The functions of the smartphone, on the other hand, refer to the possible operations that smartphones perform for the user. The features that can be found on most smartphones are as follows: a digital camera, mobile email, downloadable content, games, Bluetooth, live TV, a memory card slot, mobile office applications software (such as Microsoft Word, Excel, and PowerPoint), GPS (global positioning system), a QWERTY keyboard, productivity tools (planners, schedulers, task lists, memo pads, alarm clocks, calculators), SMS text messaging, picture and video multimedia messaging, data plans, speakers, video, quad band/global capability, and so on.

The functions that can be found on most smartphones are as follows: voice and video calling, sending and receiving email, SMS text messaging, searching the internet, searching databases of scholarly information, organizing citations, accessing a course management system, reading books and articles or listening to music, downloading files, taking photos, playing videos, making videos, setting an alarm clock, using a GPS navigation system to identify its location, playing games, creating and accessing documents (e.g., MSWord, PDFs, ebooks), desktop synchronization (which is the ability to connect a mobile device with a PC or laptop computer), IM (Instant Messaging, which enables users to take part in live text chats through an installed application without the need to open a Web browser, e.g., Whatsapp), and instantly sending photos and video files to contacts.

Through the adoption and use of smartphones, library services worldwide have changed and transformed. The features and services can be used to accomplish some library tasks and carry out related library services. Libraries of all sizes and types are embracing online and virtual collections, though most libraries will continue to offer both print and electronic collections for years to come. New purchases and acquisition of books, journals, magazines, and abstracting and indexing services, among others, are heavily weighted

towards online services. Academic libraries and their services have also been influenced by several recent transformations and improvements, such as automation, digital and virtual libraries, Web 2.0, Library 2.0, and Library 3.0 (Intelligent Libraries and apomediation). They are all web applications that have been developed to help enhance access to and delivery of library services and interaction with users. This development aligns with Ajayi's position (2005) that the traditional "brick and mortar" libraries must give way to libraries that are not limited by geography. According to Ajayi, it is necessary for libraries to reinvent themselves if they hope to develop and facilitate access to information in this digital age. The transformations that have taken place through this medium make library staff improve in terms of their services, roles, responsibilities, skills, and competencies. On the other hand, it immensely encourages undergraduates to use the libraries' virtual and online content and materials to their maximum satisfaction.

Chowdhury and Margariti (2004) pointed out that the advent of the internet and its associated web technologies in the past decade have considerably influenced the way libraries provide information services to their users and the way users choose to access information. This has brought about a drop in the physical contact of both parties with each other (i.e., library administration and patrons and vice versa). In 2010, the American Library Association (ALA) came up with a policy addressing the growth in mobile technologies and patron privacy. The brief pointed out that the enlargement in mobile technology changes the relationship between the library and the patron. This relationship is changing not only because of the decrease in face-to-face interactions but also due to concerns that patrons may have about their privacy in an age where their phones communicate at any given moment information ranging from what the patron likes to read to where the patron is located (Vollmer, 2010).

Some of the mobile library services made available to the undergraduates and other related users are text reference service (or code services), database browsing, distance learning, elearning services, SMS notification services, library guides, eresources with mobile interfaces, augmented reality services, and online public access catalogue services. Currently, almost every student studying at tertiary institutions in Nigeria owns a smartphone.

No doubt, this trend will continue at a rapid pace since most of the academic libraries now provide students with access to a wide range of electronic information resources (Tella, 2019).

In light of this development, it is essential for undergraduates to have the necessary skills to make use of smartphones to access materials and services from the library. They also need the skills to handle challenges that may arise in the process of accessing library materials and services through smartphones. Competencies in these areas will help the library design mobile services that go along with smartphone devices to access library resources anytime and anywhere. However, the extant literature and the researchers' observation on the use of smartphones for accessing library materials and services have revealed that it is not known what materials and services are accessed through smartphones by Nigerian undergraduate students. Similarly, the impact of using smartphones in accessing library materials and services by Nigerian undergraduate students has not been empirically investigated. In addition, the undergraduates' preference for using smartphones in accessing library services and the major problems encountered by undergraduates when using smartphones to access library services in a Nigerian context have not been reported in the Library and Information Science literature. This is why the current study examined undergraduates' use of smartphones for accessing library materials and services in selected academic libraries in Nigeria.

The results obtained from this study will help undergraduate students realize the importance of mobile and virtual library services to their information needs. This refers to the easy access, portability, convenience, and time-saving factors for accessing readily available resources through the use of a mobile devices. It will also help undergraduate students notice the cognizance, impact, and benefits of mobile library services. This study also seeks to expose the challenges and shortcomings met by undergraduates when using library services via smartphones and other mobile devices and suggests ways for improving the system. Librarians can then identify and understand these challenges and act as middlemen in disseminating effective instruction or user education on solving these problems while rendering mobile services to the undergraduates and other peripheral users.

OBJECTIVES OF THE STUDY

The broad objective of this study is to examine the undergraduates' use of smartphones for accessing library materials and services in selected academic libraries in Nigeria. However, the specific objectives are to:

1. Identify which smartphones are used by the undergraduates in accessing library services and materials.
2. Identify the categories of library materials accessed through smartphones by undergraduate students.
3. Determine the impact of using smartphones in accessing library materials services by undergraduate students.
4. Determine the undergraduates' preference for using smartphones in accessing library services.
5. Investigate the influence of gender, age, and year/level of study on the use of smartphones for accessing library materials and services by undergraduate students.
6. Identify the major problems encountered by undergraduates when using smartphones to access library services.

Research Questions

To achieve the stated objectives of this study, the following research questions were proposed:

1. What are the types of smartphones used for accessing library materials?
2. What are the categories of library materials and services accessed through smartphones by undergraduate students?
3. What is the impact of using smartphones to access library materials and services?
4. What is the undergraduates' preference for using smartphones to access library services?
5. What major problems are faced by undergraduates when using smartphones to access library services?

Hypothesis

Gender, age, and year/level of study will not significantly determine/predict the use of smartphones for accessing library materials and services by undergraduate students in Nigerian Universities.

LITERATURE REVIEW

Litchfield (2010) defined a smartphone as a phone that runs an open operating system and is permanently connected to the internet. Also, the smartphone has been used as a general term for the kind of phone that has an independent operating system like a PC and can achieve wireless network access through mobile communications networks (Baik, 2013). Smartphones are wireless transmission devices that can receive and transmit through digital or analogue shortwave (Rouse, 2007). A smartphone is also a device that enables access to information without being limited to a certain place or a specific time (Aharony, 2013).

There are many different types of smartphones, including the iPhone, Blackberry, Windows phones, Android, and Amazon's Fire Phone (Fortune, 2014). No doubt, the current generation is surrounded and immersed by technologies such as laptops, tablets, smartphones, and hand-held devices of every size and shape (Boren, 2014). The use of these smartphones is increasingly widespread particularly among students (elementary, secondary, and higher education), university staff, and other categories such as workers, old people, and the general public. The largest group of library users are the young generation who are mainly students and young professionals. Lippincott (2010) noted that as smartphones have become library users' key information devices, libraries should strategize to have a significant presence in offering content and services suitable for these devices.

Mobile devices and services offer enormous adaptability for those who want to take advantage of library services. With a simple 3G connection, a user lying on a beach can access ebooks and multimedia content from a library. Smartphones can access networks and content can be repeatedly streamed over a network, providing content on-demand and making it unnecessary to possess a paper copy of the material. Bomhold (2013) stressed that the younger generation is accustomed to instant information access, and for libraries to remain relevant they must redesign their services, though people may argue that too few students use their smartphones for academic purposes to justify libraries dedicating resources for mobile users. However, if you ask young people today about information access, most of them will point to mobile devices such as smartphones or tablets

(Nicholas et al., 2013). It is important for libraries to leverage the strengths of mobile technology and balance traditional services with mobile delivery. Even though many mobile users will use desktop or laptop computers to access library resources, they will benefit from the availability of mobile-friendly library services. When targeting users on the move, information professionals should be aware that the needs and behaviors of smartphone users are considerably different compared to users of fixed devices, and they should provide services in a mobile-friendly way. It is also important to promote services on social networks, given the social nature of mobile information (Walsh, 2012).

Hahn (2008) pointed out that mobile devices constituted an opportunity for crafting new library services such as in library exploration, social engagement, and outreach to traditionally underserved populations, as well as microinstruction and learning. Oksman (2010) stressed that in addition to new media, the traditional media such as newspapers, radio, and television are also available on the smartphone through the internet. Dean (2010) surveyed University of Colorado students' about their experience and expectancy with their mobile library site and found they searched for articles, read ebooks, checked out books, and contacted library staff for help. Dean further stressed that text messaging and emailing are two of the most commonly used functions on smartphones among college students, followed by reading news, watching videos, and reading books. Lippincott (2008, 2010) has argued that academic libraries can extend new types of services to users of mobile devices and develop a license or otherwise make available scholarly content configured for mobile devices.

A number of studies have been conducted on smartphones and hand-held devices along with their impact on library services. Several researchers have also studied the use of and access to library materials through smartphones. Lo et al. (2016) explored art and design students' use of smartphones for accessing library services and learning at the Hong Kong Design Institute (HKDI). A questionnaire survey was conducted involving 51 HKDI students to examine the students' utilization of apps and the internet on mobile devices to find information for the purpose of academic learning, social networking, and collaborative learning.

The survey results showed that while the HKDI students were all smartphone owners and active users of such mobile communication devices, some of them "frequently" use these mobile devices for formal learning purposes. They demonstrated a keen preference to use search engines, social communications, and other diverse uses of smartphones. Except for research and image/audio-visual needs, other needs and usage behavior was similar to mainstream university students. The results suggest opportunities for the libraries to develop services and facilities that could better fulfill students' information needs and improve the network coverage outside the library.

Mansour (2016) investigated the usage patterns and ownership of smartphone apps among students at the Department of Library and Information Science (DLIS) at South Valley University (SVU), Egypt. A survey was undertaken from February to March 2015. The survey instrument was a self-administrated questionnaire with a response rate of 82.7 percent (441/533). The study showed that students who used smartphones agreed that smartphone apps allow for easy dissemination of information, provide much information, increase the speed of finding information, help communication, are convenient and secure, and build confidence and reduce paper use. However, many students agreed that smartphone apps are time-consuming, intimidating, addictive, violate privacy, require high language and technical skills, and are harmful and frustrating. A considerable percentage of the students confirmed that they trust some apps, such as Whatsapp, email, YouTube, Facebook, Flickr, Twitter, and Viber. The most used apps identified are Facebook, email, Twitter, Whatsapp, YouTube, and Viber. For professional purposes, students used smartphones more for communication than learning purposes; however, some of the students were using apps that are related to educational purposes, such as Google mobile, Facebook, email, Twitter, YouTube, and Wikipedia mobile, but not on a regular basis. Students perceived that the email app, Google mobile, Facebook app, Whatsapp, Kiki, Twitter, YouTube, Google maps, Viber, Line, Skype, Tango, Instagram, Flickr, and Wikipedia mobile as easy to use. Additionally, they perceived that the email app, Google mobile, Whatsapp, Facebook, YouTube, Twitter, Viber, Instagram, Wikipedia mobile, Google maps, Kiki,

Skype, Line, Tango, and Flickr were more useful socializing than learning.

Bomhold (2015) investigated the availability of discovery functions on mobile devices and found that irrespective of the level of research functions available, there was a discrepancy between devices that offered a full range of services and those that offered a minimal level. Paterson and Low (2011) examined students' use of mobile devices and the benefit of academic mobile library services to students through quantitative and qualitative methods. An online survey that attracted 1,716 participants was used, and this was followed up with two discussion groups of six undergraduate and five postgraduate students. The survey followed an earlier survey conducted by the University of Edinburgh's Information Services in March 2010. The growth of smartphone ownership among students in an eight-month period was surprising: There was a 17% increase between March and November 2010. In addition, 68% of students who plan to change their mobile handset would upgrade to a smartphone. This relates to Paterson and Low's (2011) finding that most students who plan to change their mobile handset would upgrade to smartphones. As students were unable to provide feedback on the University of Edinburgh's own mobile library services, their feedback is speculative and subject to change. The paper provided evidence for libraries to determine the value of developing their own mobile services. It also demonstrated the proliferation of mobile device usage within the university and library context and indicated the services students would find most useful on a mobile device.

Seeholzer and Salem (2011) revealed that students preferred using mobile devices to interact with library resources and services, especially with research databases, library catalogues, and reference services, and communicating with the library using text messaging. Similar to the Seeholzer and Salem study, Parker (2007) investigated the use of SMS by 50 libraries from across the world and found that libraries mostly used the technology for circulation purposes while just a few librarians used it to facilitate reference services. Spires (2008) surveyed 766 librarians on their use of handhelds and their perceptions of handheld use by library patrons. The study revealed greater use of electronic organizer type functions

than accessing library-related content. The library-related functions that were reported with the highest frequency of use were catalogue access, reading documents, database access, and access to ready reference materials. Spires (2008) further noted that much of the content patrons desired to access on a handheld came with substantial additional costs to the libraries while acknowledging that demand for access to library resources on handhelds was low at the time the survey was conducted.

It is evident from the background and the literature that not much has been done from the perspective of the population of Nigerian undergraduates on their use of smartphones for accessing library materials. Similarly, it is glaring that using smartphones for accessing library materials and services is becoming commonplace; however, anecdotal records and empirical evidence on whether Nigerian undergraduates benefit from this practice and what their preferences are for it are currently lacking. Furthermore, the problems associated with the practice, considering the peculiar nature of the developing countries in Africa to which Nigeria belongs, is yet to be determined.

METHODOLOGY

Research Design

The study adopted a survey research design that seeks the opinion of individuals (undergraduate students) on a given problem (use of smartphones to access library materials and services). Rehman et al. (2011) pointed out that library users' surveys have become widespread in academic libraries during the past years. By conducting a user survey on parts of the library's functions, librarians can provide a comparative snapshot of usage in various temporal contexts.

Population of the Study

The target population of this study was the undergraduate students from five different universities in South West Nigeria. South West is one of the six geopolitical zones that make up Nigeria and was selected because it is the zone where I am based and work. The population of undergraduate students from these universities are as follows:

University A: 20,000

University B: 36,000

University C: 11,500

University D: 8,500

University E: 15,000

Total = 91,000

Sampling and Sampling Technique

There were a handful of students on campus when I conducted the study. The majority of the students were on their students' industrial work experience (SIWES) program. Thus I had to adopt a total enumeration method to involve all the available undergraduates in the five universities involved in the study See Table 1 for a breakdown of the sample from each school. A sum of 385 undergraduates represents the sample for the study, as justified by the Israel (2013) model for determining a sample size. The Israel model emphasized that in a population of 100,000, if precision is taken at ± 0.5 , the population should be 398. The sample of 385 used in this study is close to a total of 398 and this thereby justified to use as the sample in this study.

Data Collection Instruments

A questionnaire was used for collecting the data in this study due to its reliability and validity to gather accurate data. Other advantages of using a questionnaire as a research instrument, as stated by Kothari (2013), include its ability to gather information from many people, its usefulness for obtaining opinions for judgments and surveying attitudes, and its cost-effectiveness. The questionnaire was divided into two sections. The first section inquired about the respondents' demographic characteristics while the second section was subdivided into five parts and each part featured questions on each of the five variables focused on the study.

Validation of the instrument

Validity refers to the extent to which an instrument measures the effectiveness of what it is meant to measure. The questionnaire was given to two colleagues who conduct research in information communication and libraries. These colleagues ascertained the content validity of the questionnaire by indicating that it has a high degree of validity because the instrument assessed and is directly related to the factors and character traits for which it was designed. To determine the reliability, we used a test-retest method, which involves making use of the same research instrument to obtain two separate results from the same population at different two different times. A

university distinct from the five in the study was used for this purpose, and the values obtained from each of the exercises were correlated using Pearson Product Moment Correlation. Consequently, the overall correlation coefficient returned an $r = 0.91$, which indicated that the instrument was highly reliable for data collection in the study.

Method of Data Analysis

In this research, I changed the raw figures to percentage and frequency rates and tabulated them and also a graphical representation for a part of the study. The main statistical tool used for this study was percentage, and the responses were analyzed according to their relevance to the objectives and research questions.

Procedure for Data Collection

I sought permission from the authority of each library where the questionnaire was distributed, and distributed copies of the questionnaire at the libraries of the five participated university to undergraduates available in each of the libraries. The respondents were made to understand that the exercise was purely for research and that they reserved the right whether to respond to the questionnaire or not. They were also assured of the confidentiality of the information provided and that such information will not be divulged or revealed to anyone except by their permission. We distributed copies of the questionnaire ourselves and collected them immediately after each respondent indicated they had completed filling out the items. This was done to reduce the attrition rate, but despite this effort, out of a total of 500 questionnaires distributed in all the five university libraries, only 385 were filled out, returned, and good for data analysis, which constituting a 77% return rate.

RESULTS

Table 1 shows the demographic data of the respondents who took part in the study from the five universities that participated in the study. The result shows that there were 93 (24.2%) respondents from the University A; 83 (21.6%) respondents from University B; 81 (21.0%) respondents from University C; 77 (20.0%) respondents from the University D; while University E had 51 (13.2%) respondents. The result reveals that University A had the highest number of participants while University E had the lowest. The following results on the table show that respondents in 100 level

(year 1) were the majority with 29.1%, followed by undergraduates in 200 level (year 2) who had 26.2%. This is followed by 500 level (year 5) students who had a total of 19.5%, 300 level (year 3) students were next with a total of 14.8%, and finally 400 level (year 4) respondents with 10.4%. The table also shows the distribution of the respondents by gender: 60.8% of the respondents were male and 39.2% were female. This simply implies that more of the males make use of mobile library services through smartphones than females. Lastly, the table shows the age variation of the respondents and reveals that respondents within the age range of 21–25 had the highest percentage of participation with 45.5% followed by those between the ages of 16–20 with 43.1% and the participants between the ages of 26–30 had the lowest percentage of participation with 11.4%.

Table 1. Demographic Information of Students

| Demographics | Frequency | Percentage% |
|-------------------|------------|--------------|
| UNIVERSITY | | |
| University A | 93 | 24.2 |
| University B | 83 | 21.6 |
| University C | 81 | 21.0 |
| University D | 77 | 20.0 |
| University E | 51 | 13.2 |
| Total | 385 | 100.0 |
| Level | | |
| 100 | 112 | 29.1 |
| 200 | 101 | 26.2 |
| 300 | 57 | 14.8 |
| 400 | 40 | 10.4 |
| 500 | 75 | 19.5 |
| Total | 385 | 100 |
| Gender | | |
| Male | 234 | 60.8 |
| Female | 151 | 39.2 |
| Total | 385 | 100 |
| Age | | |
| 16–20 | 166 | 43.1 |
| 21–25 | 175 | 45.5 |
| 26–30 | 44 | 11.4 |
| Total | 385 | 100 |

RESEARCH QUESTION ANALYSES

Research Question 1: What are the types of smartphones used for accessing library materials?

To answer this research question, respondents were asked to indicate the types of smartphones they use to access the library materials in their respective university libraries. The answers they provided are contained in Figure 1.

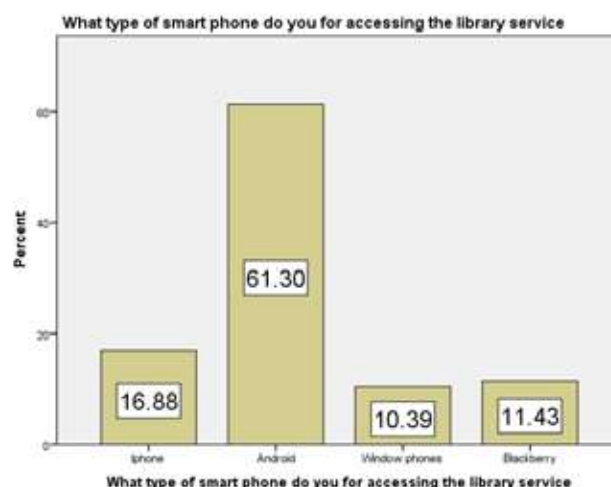


Figure 1. Different Smartphones Used for Accessing Library Materials and Services

The bar chart shows the types of smartphones used by undergraduates for accessing library materials and services. The results obtained show that a larger number of participants (61.3%) use Android smartphones for accessing library services. This constituted most of the responses from the undergraduates and shows that most undergraduates prefer to use android phones compared to other types. This is followed by 16.9% of undergraduates who use iPhones, 11.43% who use Blackberry, while (10.4%) use Windows phones to access mobile library services. The results here imply that an Android phone is the type of smartphone most often used for accessing materials and services by undergraduate students. This answers the first research question of the study.

Research Question 2: What are the categories of library materials and services accessed through smartphones by undergraduate students?

To answer the second research question, respondents were asked to indicate the categories

of library materials and services undergraduates accessed using smartphones. The results are presented in Tables 2 and 3.

Table 2. Categories of Library Materials Accessed Through Smartphones by Undergraduate Students

| | Categories of Library Materials | Frequency | Percentage % |
|----|--|-----------|--------------|
| 1. | Reference Materials (encyclopedias, dictionaries, etc.) | 76 | 19.7 |
| 2. | Serials (ejournals, emagazines, enewspapers, etc.) | 16 | 4.1 |
| 3. | Maps and Atlases | 50 | 13.0 |
| 4. | Databases (EBSCO Host, Agora, Hinari, JSTOR, Medline, etc) | 55 | 14.3 |
| 5. | Theses and Dissertations | 19 | 4.9 |
| 6. | Audio materials | 23 | 6.0 |
| 7. | Visual materials | 141 | 36.6 |
| 8. | Other | 5 | 1.3 |
| | Total | 385 | 100.0 |

Students nowadays are attracted to what they see, so the fact that a large percentage of undergraduates in this study access video information materials is not unexpected. Table 2 reveals that all manner of materials is accessed by the undergraduates through their smartphones. Visual materials are accessed by the majority of students with 141 respondents (36.6%). This is directly followed by reference materials with 76 respondents representing 19.7%. Others are databases 55 respondents (14.3%), maps and atlases 50 (13.0%), audio materials 23 (6.0%), theses and dissertations 19 (4.9), serials 16 (4.1%), and other is the category with the fewest respondents. This implies that visual materials, reference materials, databases, maps, and atlases are the basic categories of library materials accessed through smartphones by undergraduates.

Table 3 shows the categories of library services accessed by undergraduate students through a smartphone. It is evident from the results that reference services were the most often accessed service by undergraduate students through their smartphones. This is followed by circulation service, where the students have the opportunity of lending and borrowing materials, registering themselves, charging and discharging materials, and browsing the online public access catalogue.

This provides an answer to the second research question of the study.

Table 3. Categories of Library Services Accessed Through Smartphones by Undergraduate Students

| | Categories of Library Services | Frequency | Percentage % |
|----|---|-----------|--------------|
| 1. | Reference service (posting reference queries, 24/7 ask a librarian, etc.) | 158 | 41.0 |
| 2. | Circulation service (lending and borrowing, charging and discharging; registration, etc.) | 107 | 27.8 |
| 3. | online public access catalogue service | 79 | 20.5 |
| 4. | Orientation service | 17 | 4.4 |
| 5. | Translation service | 10 | 2.6 |
| 6. | Current Awareness Services | 8 | 2.1 |
| 7. | Selective Dissemination of Information | 6 | 1.6 |
| 8. | Other | 0 | 0.0 |
| | Total | 385 | 100.0 |

Research Question 3: What is the impact of using smartphones to access library materials and services?

To answer the third research question in the study, respondents were asked items on the impact of smartphone usage in accessing library materials and services by undergraduate students. The result is presented in Table 4.

Table 4 shows the impact of the use of smartphones in accessing library materials and services by the undergraduates and reveals the various benefits that undergraduates derive from the use of smartphones. The results obtained show that the highest percentage of undergraduates (52.5%) strongly agreed that using smartphones enables them to have quick access to library materials and services. This is followed by 41.6% who agree, while 2.6% disagreed, 1.6% strongly disagreed, and 1.8% were undecided. The result also show that 44.8% of the respondents who agreed that using smartphones to access library materials and services enables them to locate immediate solutions to their information needs. This was followed by 41.0% who strongly agreed, 6.5% who were undecided, 5.7% who disagreed, and 2.0% who strongly disagreed.

Table 4. Impact of Smartphones Usage in Accessing Library Materials and Services by Undergraduates

| S/N | Items | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree |
|-----|--|----------------|----------------|---------------|---------------|-------------------|
| 1. | Using smartphones to access library materials and services enables me to have quick access. | 202 (52.5%) | 160 (41.6%) | 7 (1.8%) | 10 (2.6%) | (1.6%) |
| 2. | Using smartphones to access library materials and services enables me to find an immediate solution to my information needs. | 158 (41.0%) | 172 (44.8%) | 25 (6.5%) | 22 (5.7%) | 8 (2.0%) |
| 3. | Accessing library materials and services through smartphones enables me to do my assignments on time. | 164 (42.6%) | 150 (39.0%) | 36 (9.4%) | 31 (8.1%) | 4 (1.0%) |
| 4. | Using smartphones to access library materials enables me to make a quick decision. | 128 (33.2%) | 165 (42.9%) | 52 (13.5%) | 37 (9.6%) | 3 (0.8%) |
| 5. | Using smartphones to access library materials and services enables me to have access to current information. | 178 (46.2%) | 129 (33.5%) | 29 (7.5%) | 45 (11.7%) | 4 (1.0%) |

Furthermore, the result show that 42.6% of the respondents strongly agreed that access to library materials and services through smartphones enables them to do their assignments on time. This was followed by 39.0% who agreed, 9.4% who were undecided, 8.1% who disagreed, and 1.0% who strongly disagreed. The table also shows that 42.9% of respondents agreed that using smartphones to access library materials enables them to make a quick decision. This was followed by 33.2% of the respondents who strongly agreed, 13.5% who were undecided, 9.6% who disagreed, and 0.8% who strongly disagreed. The last item of the table shows a dominant result of 46.2% who strongly agreed that using smartphones to access library services and materials enables them to have access to current information. This was followed by 33.5% of the respondents who agreed, 11.7% who disagreed, 7.5% who were undecided, and 1.0% who strongly disagreed.

These results imply that using smartphones to access library materials enables quick access to information and solutions to problems and ensures immediate solutions and timely submission of assignments. This answers the third research question of the study.

Research Question 4: What is the undergraduates' preference for using smartphones to access library services?

To answer this research question, respondents indicated their preference for using smartphones to access library services. The results are presented in Table 5.

Table 5 shows undergraduates' preference for using smartphones to access library materials and services. The results demonstrate that 36.9% agreed that they prefer using smartphones to access library materials and services rather than physically visiting the library. This is followed by 33.2% of respondents who strongly agreed, 15.3% who disagreed, 8.1% who were undecided, and 6.5% who strongly disagreed. The table also shows that 31.7% of the respondents disagreed that they prefer accessing library materials and services physically rather than using smartphones. This result is followed by 27.3% of the respondents who agreed, 17.9% who strongly agreed, 12.7% who were undecided, and 10.4% who strongly disagreed. The table again shows that 37.7% agreed they always use smartphones to access library materials and services because it is stress-free compared to physically visiting the library. This is followed by

Table 5. Undergraduates' Preference for Using Smartphones to Access Library Materials and Services

| S/N | Items | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree |
|-----|--|----------------|----------------|---------------|----------------|-------------------|
| 1. | I prefer accessing the library materials and services using my smartphones than physically visiting the library. | 128 (33.2%) | 142 (36.9%) | 31 (8.1%) | 59 (15.3%) | 25 (6.5%) |
| 2. | I prefer accessing the library materials and services physically than using my smartphone. | 69 (17.9%) | 105 (27.3%) | 49 (12.7%) | 122 (31.7%) | 40 (10.4%) |
| 3. | I will always use a smartphone to access library materials and services because it is stress-free. | 127 (33.0%) | 145 (37.7%) | 46 (11.9%) | 46 (11.9%) | 21 (5.5%) |
| 4. | I will always choose to use a smartphone over visiting the library because it allows me quick access. | 139 (36.1%) | 129 (33.5%) | 56 (14.5%) | 52 (13.5%) | 9 (2.3%) |
| 5. | I prefer accessing library materials and services using smartphones because it provides quick information that aids decision making. | 104 (27.0%) | 147 (38.2%) | 79 (20.5%) | 41 (10.6%) | 14 (3.6%) |

33.0% who strongly agreed, undecided, 11.9% who disagreed, and 5.5% of respondents who strongly disagreed.

Still, on the same Table 3, the results indicate that 36.1% of respondents strongly agreed that they prefer using smartphones over visiting the library because it allows quick access. This is followed by 33.5% of respondents who agreed, 14.5 who were undecided, 13.5% who disagreed and 2.3% who strongly disagreed. The last part of the table reveals that 38.2% of the respondents prefer accessing library materials and services than using their smartphones because it aids quick decision making. This is followed by 27.0% of the respondents who strongly agreed, 20.5% who were undecided, 10.6% who disagreed and 3.6% who strongly disagreed. This result implies that undergraduate prefer smartphones for accessing library materials and services because better than visiting the library, stress-free and allow quick access to materials and services. This hereby provides an answer to the fourth research question of the study.

Research Question 5: What major problems are faced by undergraduates when using smartphones to access library services?

To answer this research question, respondents were asked to respond to some identified challenges

revealed in the literature. The results are presented in Table 6.

Table 6 shows the problems encountered by undergraduates when using smartphones to access library materials and services. The results show that 43.6% of respondents agreed that the subscription rate for smartphones is exorbitant. This is followed by 32.7% of the respondents who strongly agreed, 11.4% who disagreed, 9.9% who were undecided, and 2.3% who strongly disagreed. The table also shows that 41.8% agreed that they experience network and internet difficulties when using smartphones. This is followed by 26.5% who strongly agreed, 18.2% who were undecided, 11.4% who disagreed, and 2.1% who strongly disagreed.

Furthermore, 37.7% of the respondents also agreed that smartphones are expensive compared to other phones. This is followed by 26.8% who strongly agreed, 15.6% who were undecided, 15.1% who disagreed, and 4.9% who strongly disagreed. It also revealed that 42.1% disagreed that smartphones are complex to operate. This is followed by 19.2% who agreed, 18.7% who strongly disagreed, 11.7% who were undecided, and 8.3% who strongly agreed.

The results further reveal that 32.5% of respondents agreed that smartphones do not last

Table 6. Problems Encountered by Undergraduates when Using Smartphones to Access Library Materials and Services

| S/N | Items | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree |
|-----|--|----------------|----------------|---------------|----------------|-------------------|
| 1. | Exorbitant rates for smartphone subscriptions. | 126 (32.7%) | 168 (43.6%) | 38 (9.9%) | 44 (11.4%) | 8 (2.3%) |
| 2. | Network and internet access difficulties. | 102 (26.5%) | 161 (41.8%) | 70 (18.2%) | 44 (11.4%) | 19 (2.1%) |
| 3. | Smartphones are expensive to buy compared to other phones. | 103 (26.8%) | 145 (37.7%) | 60 (15.6%) | 58 (15.1%) | 72 (4.9%) |
| 4. | Smartphones are complex to operate. | 32 (8.3%) | 74 (19.2%) | 45 (11.7%) | 162 (42.1%) | 51 (18.7%) |
| 5. | Smartphones do not last for a long period. | 33 (8.6%) | 125 (32.5%) | 57 (14.8%) | 119 (30.9%) | 51(13.2%) |
| 6. | Smartphones serve as a distraction to undergraduate users. | 84 (21.8%) | 120 (31.2%) | 72 (18.7%) | 58 (15.1%) | 77(13.2%) |
| 7. | Typing on a smartphone is not convenient. | 34 (8.8%) | 77 (20.0%) | 66 (17.1%) | 131 (34.0%) | (20.0%) |

for a long period. This is followed by 30.9% who disagreed, 14.8% were undecided respondents, 13.2% strongly disagreed, and 8.6% who strongly agreed. Also, 31.2% agreed that smartphones serve as a distraction to undergraduate users. This is followed by 21.8% of the respondents who strongly agreed, 18.7% who were undecided, 15.1% who disagreed, and 13.2% who strongly disagreed. For the last item, 34.0% of the respondents disagreed that typing on smartphones is not convenient. This is followed by 20.0% of respondents who agreed, 20.0% who strongly disagreed, 17.1% who were undecided, and 8.8% who strongly agreed. This implies that the significant problems associated with accessing library and services through smartphones are subscription rates, network and internet issues, the expensive nature of smartphones in terms of cost, and users are prone to distractions. This hereby answers the fifth research question of the study.

Hypothesis 1: Gender, age, and year/level of study will not significantly determine/predict the

use of smartphones for accessing library materials and services by undergraduate students in Nigerian Universities.

To analysis data on this hypothesis, an ANOVA and multiple regression analysis were conducted, and the results obtained are presented in Table 7.

Table 7 shows the joint contribution of demographic data (gender, age, and year/level of study) on the use of smartphones for accessing library materials and services by undergraduate students. It can be confirmed from the coefficient of multiple correlations ($R = .622$ and a multiple R^2 of .241). This means that 24.1% of the variance is accounted for by the three demographic factors when taken together. The significance of the composite contribution was tested at $P < .05$. Also, the table shows that the analysis of variance (ANOVA) for the regression yielded an F-ratio of 25.13 (significant at 0.05 level). This implies that the joint contribution of the demographic factors (gender, age, and year/level of study) to the dependent variable (use of smartphones) was

Table 7. Joint Contribution of Gender, Age, and Year/Level of Study to the Prediction of Smartphones by Undergraduate Students

| R | R Square | Adjusted R Square | Std. Error of the Estimate | |
|----------------------|----------------|-------------------|----------------------------|---------|
| .622 | .241 | .127 | 4.56431 | |
| Analysis of Variance | | | | |
| Model | Sum of Squares | DF | Mean Square | F-ratio |
| Regression | 440.222 | 3 | 146.74 | |
| Residual | 2232.321 | 382 | 5.84 | 25.13 |
| Total | 2672.543 | 385 | | |

Source: Field Survey (2019)

Table 8. Relative Extent of Prediction of Demographic Factor on Use of Smartphones by Undergraduate Students

| Model | B | Std. Error | Beta | T-value | P |
|---------------------|--------|------------|------|---------|------|
| Constant | 17.434 | 2.806 | | 4.433 | .000 |
| Gender | .299 | .072 | .188 | 2.114 | .000 |
| Age | .501 | .085 | .193 | 2.313 | .000 |
| Year/level of Study | .487 | .089 | .256 | 2.617 | |

Source: Field Survey (2019) Dependent variable: Patronage Intention Predictors: Service Quality and Satisfaction

significant. Therefore, the null hypothesis is not accepted. This implies that gender, age, and year/level of study significantly influence the use of smartphones for accessing library materials and services by undergraduate students.

Table 8 shows the extent to which each of the demographic factors/variables had a significant influence on use of smartphones by the undergraduate students. The results reveal that year/level of study had the most significant influence (Beta = .256; $t = 2.617$). Age is next with Beta = .193; $t = 2.313$, while gender exerted the least significant with Beta = .188; $t = 2.114$. It can be inferred from these results that differences exist in the undergraduates' use of smartphones. This is shown with the value of t obtained in each of the demographic factors.

DISCUSSION OF FINDINGS

This study examined undergraduate students' use of smartphones for accessing library materials and services in selected academic libraries in South West Nigeria. The findings demonstrate that an Android phone is the smartphone most often used by undergraduate students to access library materials and services. Visual materials, reference materials, databases, maps, and atlases are the basic categories of library materials accessed through smartphones by the undergraduates. Reference service was the most accessed service by undergraduate students

through their smartphones followed by circulation service along with the online public access catalogue. Using smartphones to access library materials enables quick access to information, offers solutions to problems, and allows immediate and timely submission of assignments. In terms of preference, undergraduate students prefer using smartphones to access library materials and services because it saves time compared to visiting the library, it is stress-free and allows quick access to materials and services. Gender, age, and year/level of study significantly influenced the use of smartphones for accessing library materials and services by undergraduate students. The significant problems associated with accessing library materials and services through smartphones are their high subscription rates, network and internet issues, high cost of smartphones, and their being prone to distracting students.

The finding that an Android phone is the type of smartphone used most often to access materials and services by the undergraduate students goes along with the position of (Fortune, 2014), who revealed that many different types of smartphones, including the iPhone, Blackberry, Windows phone, Android, and Amazon's Fire Phone, are used for accessing materials and services in the library. This implies that the results of this study are not a coincidence. Today's younger generation wants an

immediate response to their queries and require an immediate solution to their information problems. The quick connection usually provided by Android that links them to relevant materials and services in the library may be the rationale behind the findings reported in this study.

Visual materials, reference materials, databases, maps, and atlases are the basic categories of library materials accessed through smartphones by the undergraduates. In most libraries today, and just like some of the libraries mentioned earlier, resources are available electronically and most of these resources are accessed through technological devices such as smartphones. This agrees with Bomhold (2013), who states that the younger generation is accustomed to instant information access. Access to these materials is fast and satisfactory for the undergraduate students and hence their continued use of these devices is not a surprise. Most of the resources in the library have been digitized and are compatible with smartphones for easy access.

Reference service was the most often accessed service by undergraduate students through their smartphones followed by circulation service along with the online public access catalogue. These findings correlate to those reported by Oksman (2010), who stressed that in addition to new media, traditional media such as newspapers, radio, and television are also made available on the smartphone through the internet. Similarly, the revelation by Bomhold (2013) that the younger generation is accustomed to instant information access may be the reason behind this result. No doubt, undergraduate students do not want to stress themselves any more by going to the library. Most of them possess the necessary skills to get what they desire from the library without leaving the comfort of their home. They can pose queries to the reference librarians anytime and anywhere because their action will be followed by an immediate response.

Using smartphones to access library materials enables quick access to information, offers solution to problems, ensures immediate resolutions, and fosters timely submission of assignments. The report by Lo et al. (2016) buttresses this result when they showed that students were all smartphone owners and active users of such mobile communication devices, and they “frequently” used the mobile devices for formal learning purposes.

Undergraduate students prefer smartphones for accessing library materials and services because they save time compared to visiting the library and they are stress-free and allow quick access to materials and services. This is in line with the report by Mansour (2016), whose findings demonstrated that smartphone apps allow for the easy dissemination of information, provide too much information, increase the speed of finding information, help communication, are convenient and secure, build confidence, and reduce paper use. Similarly, Lo et al. (2016) found that respondents in their study demonstrated a keen preference to use diverse smartphones for research and image/audio-visual needs, and the fact that the rest of the students’ needs and usage behavior was similar to mainstream university students lends credence to this current finding. The literature has initially demonstrated that these students enjoy the immediate gratification of having things on demand, which implies that as libraries offer services compatible with technological devices such as smartphones, the preference for its use to access materials and services in the library will continue.

The significant contribution of demographic factors (gender, age, and year/level of study) to the use of smartphones by undergraduate students in this study is unexpected. Previous studies, such as Olaitan (2018), showed that sociodemographic factors such as age, gender, status, level of education, occupation, income, and social influence are the major determinants of mobile phone ownership and usage in rural areas. It also showed that age and gender affect the perceived benefit and satisfaction of mobile phones in rural communities. Similarly, Yeshwanth and Jacobs (2014) found that a relationship exists between the age of the respondents and the years of usage of smartphones. In the same vein, Rosenfeld et al. (2018) found that different gender and age demographics had significantly different usage habits in almost all messages and group attributes. The finding by Gladen (2018) supported age influence on the use of smartphones.

The significant problems associated with accessing the library and its services through smartphones are high subscription costs, network and internet issues, the expensive nature of smartphones in terms of cost, and the fact that

they are prone to distract students. This finding corroborates the finding by Mansour (2016), who reported that using smartphones to access materials and services in the library is time consuming, intimidating, addictive, violates privacy, requires high language and technical skills, and is harmful and frustrating. Similarly, the studies by Chaputula and Mutula (2018) and Sharma and Madhusudhan (2017) found that the high cost of mobile internet and websites were not mobile-friendly and notable factors that negatively impacted the use of mobile phones, which support the findings of the current study. Meanwhile, it should be noted that there is no technology without some associated limitations. As good as the practice of access to materials and services in the library is, there are associated challenges, and these challenges are on par with the challenges revealed in this current study.

CONCLUSION

Based on the findings reported in this study, it can be concluded that the Android phone is the type of smartphones most often used to access materials and services by the undergraduate students. Visual materials, reference materials, databases, maps, and atlases are the basic categories of library materials undergraduates' access through smartphones. Reference service is the most often accessed service by the undergraduate students through their smartphones followed by circulation service and the online public access catalogue. The use of smartphones to access library materials enables quick access to information, offers solutions to problems, and enables an immediate and timely submission of assignments. Undergraduates prefer smartphones for accessing library materials and services because it saves time compared to visiting the library, it is stress-free, and it allows quick access to materials and services. Gender, age, and year/level of study significantly influence the use of smartphones for accessing library materials and services by undergraduate students. Problems associated with accessing library materials and services through smartphones are high phone subscription rates, network and internet issues, the high cost of smartphones, and that they are prone to distract students.

RECOMMENDATIONS

In light of the findings and the conclusion of this study, the following are recommended:

1. Academic libraries in Nigeria should develop services and facilities that better accommodate undergraduate students' information needs.
2. The network coverage outside the library should be improved
3. University libraries in Nigeria should also make sure that all their information materials and services are digitalized to make them accessible through digital devices such as smartphones.

There is a need for the Nigerian university libraries to further facilitate the services accessible through digital devices. Doing this will ensure that reference service, circulation service, and the online public access catalogue can be accessed by undergraduates through their smartphones. Network providers to the university libraries in Nigeria need to consider making a subscription to their network unnecessary because their highest number of subscribers are poor undergraduate students. Similarly, university internet providers in Nigeria should work more on their network in terms of lessening the delay in the response time and the speed of access to library materials and services by undergraduate students. Smartphone producers should consider lessening the cost of their products since their number one stakeholder and customers are poor younger generation, including undergraduate students. Undergraduates in Nigeria universities should use smartphones only for learning and other academic purposes and not to distract themselves as this may be detrimental to their academic success.

IMPLICATIONS OF THE STUDY

Undergraduate students are familiar with the use of smartphones to access library materials and services and this is yielding positive results for them. Therefore, university libraries in Nigeria will have to embark on full digitization of their materials and services to make them compatible with what can be accessed through smartphones.

Also, materials and services must be available to the undergraduate students 24/7 for easy accessibility. This means that the university libraries in Nigeria will have to work on their biggest problem of incessant power outages, which is an impediment to accessing materials and services through smartphones by the undergraduate students.

Similarly, since undergraduate students enjoy accessing materials and services through their smartphones, they will have pose queries to the library when what they are looking for is not accessible. This means that university libraries in Nigeria will have to designate information and communication technology savvy staff to answer queries when undergraduate students encounter problems in the process of using their smartphones to access library materials and services.

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