



FACTORS INFLUENCING PERCEIVED USEFULNESS AND ADOPTION OF SMART DEVICES AMONG UNDERGRADUATES OF LEAD CITY UNIVERSITY IBADAN

By

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Abstract

The adoption of smart devices among university undergraduates has significantly influenced academic performance, communication, and digital literacy. This study examines the factors influencing the perceived usefulness and adoption of smart devices among undergraduates of Lead City University, Ibadan. A descriptive research design was adopted, and a stratified random sampling technique was used to select a sample size of 216 respondents. The study was guided by four research questions. A structured questionnaire was used for data collection, and data were analysed using descriptive statistics. The findings reveal that factors such as ease of use, affordability, technological exposure, and peer influence significantly impact the adoption of smart devices. The study recommends among others an increased awareness campaigns on the academic benefits of smart devices and improved access to affordable technology for students

Keywords: smart devices, adoption, perceived usefulness, undergraduates

Introduction

Smart devices are described as those pieces of equipment made for transmitting conversations and other sounds in real-time across distances that allow their users to do more than make phone calls and send text messages. Smart devices can browse the Internet and run software programs like a computer. Smart devices combine the cell phone with email and Web, music and movie player, camera, camcorder, GPS navigation, voice recorder, alarm clock, flashlight, photo album, address book and a lot more. Smart devices have become necessary electronic gadgets found everywhere among the general public. They offer easy access to a large volume of information on the internet than ever before. Smart devices offer students great opportunities to learn and discuss issues in situations where they are apart physically. It also encourages

cooperative learning as an alternative to books, computers or attending physical classroom lectures on campus (Dzamesi, *et al.*, 2019).

Advances in technologies and ICTs have led to the greater use of smart devices in the education sector, particularly at the university level. Many institutions worldwide have started to experiment with various learning methods and integrate mobile phone use to facilitate students' learning. The higher education sector has become increasingly technology-driven. Smart devices are attractive tools for the majority of young people, particularly university undergraduates and integrating them in learning is something valuable. Self-directed learning and study have been occurring because of students' use of their smart devices, and the responsibility of learning



has been transferred from the teacher to the student (Saleem and Masadeh, 2021).

The use of smart devices by undergraduates could be determined by the perceived usefulness of smart devices. Perceived usefulness suggests the result and outcomes of using smart devices. Perceived usefulness is the degree to which an individual believes that using a particular system would enhance their performance. Osubor and Chiemekwe (2015) define perceived usefulness as the degree to which an individual believes that using smart devices will bring enhanced learning outcomes and performance.

However, the acceptance or otherwise of smart devices is highly dependent on the perception of undergraduates on the ease of using smart devices, as well as undergraduates' perception of the usefulness of smart devices (Elias *et al.*, 2021). A positive perception of the usefulness of smart devices by undergraduates would determine if such devices would be used or rejected by undergraduates. Some of the smart devices are good, but some give more comfort compared with some other smart devices. This is evident in the fact that undergraduates often make findings from their friends using these devices to find out the level of comfort they derived from using their smart devices so that they might be guided in their choice of theirs.

These days, smart devices are incredibly popular among undergraduates, mainly because they're seen as useful tools for learning, research, communication, and sharing information. Students are using them for various educational purposes now more than ever (Wisnuwardana, 2019). In addition, smart devices are being utilised as a means of knowledge downloading, uploading, and sharing (Al-Fawareh & Jusoh, 2017). Undergraduates can effectively manage their study time. They can access updated e-books and online prerequisite materials using various types of software popular on smart devices, making learning more flexible, enjoyable, and efficient in terms of time and place (Masadeh & Elfeky, 2016). Smart devices provide many opportunities to create, deliver and support innovative methods of learning. Reference is made to the use of smart devices in facilitating collaboration and communication, enhancing

creative and interactive learning styles and the development of tools, and applications to aid in the delivery of educational content.

The increasing reliance on smart devices among undergraduates has generated significant scholarly interest, particularly concerning factors influencing their perceived usefulness and actual usage. Several studies have explored the integration of smart devices in education, focusing on their potential to enhance learning experiences (Elias, *et al.*, 2021; Ikenwe, 2023; Olori, *et al.*, 2020). However, the extent to which students perceive these devices as useful and factors influencing the adoption patterns remain areas requiring further exploration.

Literature Review

Theoretical Framework: Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis in 1989, serves as a theoretical framework for understanding how people adopt smart devices. According to TAM, two key factors—perceived usefulness (PU) and perceived ease of use (PEOU)—play a significant role in whether users accept and adopt new technology. PU refers to how much an individual believes that using a specific technology will improve their performance, while PEOU indicates how effortless the technology is perceived to be. To explore the factors influencing perceived usefulness and the use of smart devices, this study utilizes the TAM introduced by Davis in 1989. While many studies have confirmed the validity of TAM in the realm of educational technology (Venkatesh & Bala, 2008), its relevance to smart device usage among Nigerian undergraduates has not been extensively examined. For instance, Olori *et al.* (2020) demonstrated that perceived ease of use plays a significant role in students' adoption of mobile learning. Their research overlooked contextual challenges like digital literacy and infrastructure issues. This study expands on TAM by incorporating these external factors to offer a deeper insight into smart device usage in higher education.

In this study, TAM is used to analyse how undergraduates at Lead City University embrace smart devices for their academic needs. The model implies that if students view smart devices



as both useful and easy to navigate, they are more likely to adopt them. Additionally, factors like cost, availability, and support from the institution can also impact adoption by influencing perceptions of PU and PEOU.

Perceived usefulness and smart devices used by undergraduates

Several studies conducted in Nigeria have explored students' attitudes toward smart devices. Ikenwe (2023) found that undergraduate students at Ambrose Alli University consider smartphones essential for their academic work, with their perceived usefulness being a strong predictor of adoption. Similarly, Oladosu et al. (2020) noted that although smart devices are commonly used, technological stress (technostress) can hinder students' ability to effectively utilize them for learning.

A study by Ifeanyi and Chukwuere (2018) revealed that smart devices help students to communicate with their classmates as well as their course masters. Also, students use smart devices to explain facts, illustrations, and concepts to colleagues. In the same study, it was brought to bear that smart devices support students' learning activities in a myriad of ways, such as downloading study materials, recording live lectures, accessing lecture slides at a convenient time, supporting research work and doing assignments. In the same vein, Alzougool and Almansour (2017) recorded that the use of smart devices performs remarkable roles in students' learning activities. For instance, students use smart devices for registering for courses, checking lecture time tables and exam schedules, checking grades, having group discussions, reading announcements and for the payment of school fees and many more.

Tuncay (2016) found that smart devices were very useful to students; they enabled them to take lecture notes, surf the internet, and quickly capture concepts for later use. Akaglo and Nimako-Kodu (2019), in their study, investigated and established that the use of smart devices enhances learning activities; it helps students to conduct research at their own pace, and they can retrieve relevant and up-to-date information for their assignments and projects without necessarily visiting the library physically. Also, it

enables students to read ahead of time before class to have a fair idea of lessons yet to be taught. The study of Tuncay (2016) found that the use of smart devices has made distance learning very effective. For instance, it provides the opportunity for students to save all their lecture materials on a portable smart device without carrying heavy weight laptops or books. Students can access their lecture materials on their phones, while lecturers can also interact with their students digitally, irrespective of the geographical location.

However, these studies often view perceived usefulness and actual usage as straightforward connections. Recent literature indicates that other factors, such as self-efficacy, motivation, and socioeconomic status, play a mediating role in these relationships (Adedoyin & Soyemi, 2021). Additionally, research by Aderibigbe and Alabi (2022) shows that gender and academic discipline affect students' attitudes toward smart technology, a factor that has frequently been neglected in earlier studies. Therefore, this study aims to build on existing research by investigating how individual and contextual factors interact with perceived usefulness to influence the actual usage of smart devices.

Undergraduates' Use of Smart Devices

Smart devices are the most common personal communication technologies used worldwide (Atas & Celik, 2019). Smart devices are particularly popular among undergraduates as they provide easy access to the Internet. This allows students to tap into a wide range of information sources, making smart devices essential tools for their online activities (Sun & Gao, 2020). Smart devices create an opportunity for undergraduates as learning tools. Smart devices have great potential for accessing information as they enable undergraduates to easily access information resources through browsing the Internet and downloading different materials relating to academic activities. Also, the advanced features of mobile phones enable the easy sharing of different information like lecture notes, assignments, continuous assessment tests, and announcements among fellow students or between teachers and students, especially using mobile apps like WhatsApp and Telegram (Kates et al., 2018).



Smart devices enhance access to various social media, such as YouTube, which enables students to watch videos relating to various subjects (Latif et al., 2019). It enables undergraduates to communicate and collaborate with fellow students on various academic issues and communicate with instructors and supervisors teaching various courses. Smart devices enable students to use various platforms such as Google to accomplish their tasks more conveniently, within a short time and hence save time and resources because they can work remotely (Hidayat, 2020).

In a study by Wisnuwardana (2019), it was found that students were considerably enthusiastic about using smart devices to support learning because of their substantial potential that can be enhanced for learning through systematic and purposeful activities properly designed for learning-related activities. Meanwhile, the study of Iqbal & Bhatti (2020) revealed that smart devices were an effective medium for off-campus learning and communication with peers and students. Complex topics were explained easily to students as audio-visual content can be available over the Internet and can be shared easily.

Despite the growing body of literature, there are still notable gaps in the perceived usefulness and adoption of smart devices among undergraduates. Firstly, many studies in Nigeria tend to address mobile learning broadly instead of focusing specifically on smart device usage through a structured theoretical framework like the Technology Acceptance Model (TAM). Secondly, although perceived usefulness is recognized as a crucial factor in adoption, there is a lack of insight into how external moderating factors—such as socioeconomic status, institutional support, and digital literacy—affect this relationship. Thirdly, current research has not adequately examined the differences between perceived usefulness and actual usage, especially in environments with limited resources.

This study seeks to fill these gaps by thoroughly analysing the relationship between perceived usefulness and smart device usage among Nigerian undergraduates, using TAM as a foundational framework. In doing so, it aims to

enhance our understanding of the factors influencing smart device adoption in higher education and provide valuable insights for policymakers and educators looking to improve technology-enhanced learning environments.

Methodology

The study adopted the descriptive survey research design. The population for this study consisted of undergraduates at Lead City University, Ibadan, with a total number of 2181. Stratified random sampling was used for the study, and a sampling fraction of 10% was used, which gave a total sample size of 216 respondents for the study. The research collection instrument was a structured questionnaire. Statistical Product and Service Solutions (SPSS) were used for the analysis. Descriptive statistics, such as frequency and percentages, were used to analyse the research questions.

Statement of the problem

Smart devices, including Windows phones, Java phones, iPhones, Palmtops, Android phones, iPods, Tablet PCs, and iPads, facilitate undergraduates' access to essential information resources for their academic pursuits, significantly enhancing their educational activities. Despite the widespread acknowledgement of the advantages of these devices in supporting academic pursuits, there are inconsistencies between students' perceptions of the usefulness of these technologies and their actual usage. Understanding the factors that influence these perceptions is crucial for maximizing the educational benefits that smart technologies can offer. The relationship between perceived usefulness and actual usage is complex and may be moderated by external barriers. Oladosu *et al.* (2020) observed that while smart devices are prevalent among students, technostress can negatively impact learning outcomes. This suggests that even when students recognize the potential benefits of smart devices, challenges such as technostress, cost, internet connectivity issues, battery lifespan, and inadequate institutional support can hinder effective utilization. A thorough understanding of these dynamics is essential for lecturers and policymakers to develop effective initiatives.



Research Questions

The following research questions were raised to guide the investigation:

1. What are the smart device types commonly used by undergraduates?
2. What are the academic activities carried out with smart devices by undergraduates?
3. What are the constraints to the use of smart devices by undergraduates?
4. What is the level of perceived usefulness of smart devices by undergraduates?

Results and discussions

Table 1: Demographic characteristics of the respondents

Demographic characteristics	Frequency	Percentage
Level		
100	16	7.9
200	69	34.2
300	55	27.2
400	47	23.3
500	15	7.4
Age (in years)		
16-20	87	43.1
21-25	76	37.6
26-30	25	12.4
>30	14	6.9
Total	202	100.0
Gender		
Male	98	48.5
Female	104	51.5
Total	202	100.0
Religion		
Christianity	152	75.2
Islam	50	24.8
African Traditional Religion	-	-
Total	202	100.0
Personal Monthly Income		
<5000	-	-
5000-10000	25	12.4
10000-15000	34	16.8
15000-20000	37	18.3
20000-25000	39	19.3
>2500	67	33.2
Total	202	100.0

Note. Percentages are rounded to one decimal place.

Source: Researcher (2024)

Table 1 presents the demographic characteristics of the respondents, showing that most students were within the 16–25 age range, with a fairly balanced gender distribution. The majority of respondents identified as Christians and had varying levels of personal monthly income, with a significant proportion earning below ₦15,000.



Table 2: Smart Devices Commonly Used by Undergraduates

Device	Strongly Agree (SA)	Agree (A)	Disagree (D)	Strongly Disagree (SD)
Windows phones	50 (24.8%)	55 (27.2%)	51 (25.2%)	46 (22.8%)
Java phones	50 (24.8%)	55 (27.2%)	51 (25.2%)	46 (22.8%)
iPhone	62 (30.7%)	56 (27.7%)	47 (23.3%)	37 (18.3%)
Palmtop	55 (27.2%)	78 (38.6%)	64 (31.7%)	5 (2.5%)
Blackberry	82 (40.6%)	51 (25.2%)	36 (17.8%)	33 (16.3%)
Android phones	137 (67.8%)	56 (27.7%)	2 (1.0%)	7 (3.5%)
Symbian phones	50 (24.8%)	55 (27.2%)	51 (25.2%)	46 (22.8%)
iPod / non-iPod	50 (24.8%)	55 (27.2%)	51 (25.2%)	46 (22.8%)
Tablet PC	70 (34.7%)	47 (23.3%)	26 (12.9%)	59 (29.2%)
iPad	123 (60.9%)	55 (27.2%)	20 (9.9%)	4 (2.0%)

Note. Percentages are rounded to one decimal place.

SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree.

Source: Researcher (2024)

Table 2 indicates that Android phones were the most commonly used smart devices among undergraduates, with a high percentage of respondents strongly agreeing to their usage. Other frequently used devices included iPads and Palmtops. The preference for Android phones aligns with the perceived ease of use and affordability constructs of the TAM model, making them the dominant choice among students.

Table 3: Academic Activities Carried Out with Smart Devices

Activity	Strongly Agree (SA)	Agree (A)	Disagree (D)	Strongly Disagree (SD)
Class work	127 (62.9%)	61 (30.2%)	14 (6.9%)	0 (0%)
Project	138 (68.3%)	48 (23.8%)	14 (6.9%)	2 (1.0%)
Seminars	113 (55.9%)	83 (41.1%)	6 (3.0%)	0 (0%)
Lectures	92 (45.5%)	91 (45.0%)	15 (7.5%)	4 (2.0%)
Team papers	89 (44.1%)	94 (46.5%)	19 (9.4%)	0 (0%)
Assignment	141 (69.8%)	53 (26.2%)	8 (4.0%)	0 (0%)
Examination	50 (24.8%)	55 (27.2%)	51 (25.2%)	46 (22.8%)
Practicals	50 (24.8%)	55 (27.2%)	51 (25.2%)	46 (22.8%)

Note. Percentages are rounded to one decimal place.

SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree.

Source: Researcher (2024)

Table 3 highlights that smart devices are predominantly used for assignments, project work, and seminar preparations. This supports the perceived usefulness construct of TAM, as students recognize smart devices as tools that enhance learning and academic productivity. However, their adoption for examinations and practical remains relatively low, suggesting the need for further institutional integration.



Table 4: Constraints to Smart Devices Use by Undergraduates

Barrier	Strongly Agree (SA)	Agree (A)	Disagree (D)	Strongly Disagree (SD)
Low lifespan of the battery of smart devices	141 (69.8%)	53 (26.2%)	8 (4.0%)	0 (0%)
Erratic power supply	138 (68.3%)	48 (23.8%)	14 (6.9%)	2 (1.0%)
Small screen to read documents	42 (20.8%)	57 (28.2%)	57 (28.2%)	42 (20.8%)
Lack of information literacy skills	37 (18.3%)	37 (18.3%)	62 (30.7%)	66 (32.7%)
Slow internet network	101 (50.0%)	57 (28.2%)	38 (18.8%)	6 (3.0%)
Limited memory	69 (34.2%)	79 (39.1%)	45 (22.3%)	9 (4.5%)
Costly and more expensive for students to acquire	118 (58.4%)	42 (20.8%)	35 (17.3%)	7 (3.5%)
Small size of phone keyboard	97 (48.0%)	72 (35.6%)	26 (12.9%)	7 (3.5%)
Slow data entry and slow downloading in database format	37 (18.3%)	37 (18.3%)	62 (30.7%)	66 (32.7%)
Accidental loss of data or damage of equipment	127 (62.9%)	61 (30.2%)	14 (6.9%)	0 (0%)
Privacy concern	37 (18.3%)	37 (18.3%)	62 (30.7%)	66 (32.7%)
Prefer pen and paper	101 (50.0%)	57 (28.2%)	38 (18.8%)	6 (3.0%)
Device too delicate	69 (34.2%)	79 (39.1%)	45 (22.3%)	9 (4.5%)
Poor quality of software	63 (31.2%)	64 (31.7%)	61 (30.2%)	14 (6.9%)

Note. Percentages are rounded to one decimal place.

SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree.

Table 4 presents various constraints limiting smart device adoption. Key barriers include low battery lifespan, erratic power supply, high costs, and slow internet networks. These challenges directly influence perceived ease of use, a crucial determinant of adoption in TAM. If these barriers persist, students may find it difficult to integrate smart devices effectively into their academic activities.

Table 5: Frequencies and Percentages of Responses to Statements on the Use of Smart Devices for Academic Activities

Statement	Strongly Agree (SA)	Agree (A)	Disagree (D)	Strongly Disagree (SD)
I can easily use smart devices for learning.	141 (69.8%)	53 (26.2%)	8 (4.0%)	0 (0%)
I feel that using smart devices makes my academic activities clear and understandable.	92 (45.5%)	91 (45.0%)	15 (7.0%)	4 (2.0%)
I feel that using smart devices makes it easy for me to download electronic resources that enhance my academic activities.	113 (55.9%)	83 (41.1%)	6 (3.0%)	0 (0%)
I feel that using smart devices makes interactions with my colleagues that centre in academic activities easy.	89 (44.1%)	98 (46.5%)	19 (9.4%)	0 (0%)
I feel I can easily share information with the use of smart devices.	100 (49.5%)	61 (30.2%)	41 (20.3%)	0 (0%)

Note. Percentages are rounded to one decimal place.

SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree.



Table 5 shows students' perceptions regarding the use of smart devices in academic activities. A significant percentage of respondents agreed that smart devices facilitate learning, resource downloading, and collaboration with peers. This finding aligns with the TAM model, indicating that when students perceive smart devices as useful, they are more likely to adopt them.

Interpretation of Findings Using the Technology Acceptance Model (TAM)

The findings from Tables 2–5 align with the TAM model in several ways:

1. **Perceived Usefulness:** The strong agreement on the academic advantages of smart devices (Table 3) shows that students see their potential to enhance learning outcomes. This aligns with the TAM model, which suggests that people are more likely to adopt technology when they recognize its benefits.
2. **Perceived Ease of Use:** The prevalence of Android phones (Table 2) indicates that students favour devices that are both affordable and user-friendly. However, issues like battery life, inconsistent power supply, and internet connectivity (Table 4) can complicate usability, possibly affecting their willingness to adopt these devices.
3. **External Variables:** The cost of smart devices and the financial constraints faced by students (Table 1) play a crucial role in their adoption. This supports TAM's view that external factors can shape perceptions of usefulness and ease of use.
4. **Behavioural Intention to Use:** Even with these challenges, most students continue to utilize smart devices for their academic work (Table 5), reflecting a strong intention to keep using them.

Conclusion

This study examines the main factors influencing undergraduates' perceptions of the usefulness and adoption of smart devices. It concludes that ease of use, affordability, exposure to technology, and peer influence are crucial in determining the adoption of smart devices among students at Lead City University. To improve adoption rates, the university administration should work with technology companies to provide affordable devices and offer training programs focused on

digital literacy. Additionally, campaigns should be launched to raise awareness of the academic benefits associated with smart devices. Addressing infrastructural challenges, such as unreliable power supply and slow internet connectivity, will also enhance the ease of adoption.

Recommendations

The study recommends that:

1. University administration should work with technology companies to provide affordable smart devices for academic activities.
2. University management should develop a policy that mandates all undergraduates to own smart devices before they can be duly registered for the academic session.
3. Adequate awareness and user education should be provided by library staff, especially those in charge of emerging technologies to promote the use of smart devices for academic activities by undergraduates.
4. Detailed guidance and explanation on how to use smart devices appropriately in classroom settings is imperative for meaningful learning. Universities should introduce training programs to improve students' digital skills.
5. Professionals and experts in the field of knowledge should explore creative ways of using smart devices as learning tools to make it attractive for extensive use by undergraduates.



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