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Awareness and use of Virtual Assistant Technologies by postgraduate students of the University of Ibadan, Nigeria

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Abstract

The spread of the Internet has led to advanced technological inventions. One of the technological innovations considered engaging is the Virtual assistants (VAs), designed to imitate human-like behaviours. This study was designed to investigate the awareness and use of VAs focusing on postgraduate students at the University of Ibadan, Nigeria. A survey research design was adopted, and a multistage sampling technique was used to select the respondents. Data was collected with a structured questionnaire. Findings revealed that most students were aware of VAs and had a high level of use. VAs were used for various purposes, mainly general knowledge, work-related tasks, and entertainment. The students used VAs because of the following: the multitasking ability of VAs, the ability of VAs to provide immediate feedback to users, the ability of VAs to provide personalised and individualised communication with users, the fun derived from the use, the ability of the user to pick up on other signals or information that are conveyed through VAs, and the ability of VAs to understand and convey information in everyday language that its users easily understand. A major challenge associated with use is that VAs sometimes misunderstand the students' requests or commands because of differences in accents. Since an individual's understanding of VAs plays a crucial role in their utilisation, stakeholders should consider providing education and training programmes that could increase users' knowledge and confidence in interacting with VAs to ensure increased and continuous usage. VA developers need to improve on language and accent recognition.

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Introduction

Undoubtedly, technology is one of the world's greatest assets that has enabled its users to perform various tasks without difficulties. The Internet, in particular, has revolutionised people's lives and has brought about advancements in technology to simplify daily activities. The positive impact of the Internet and technological progress can be seen in every sector of the economy. The Internet has altered how people connect, permitting long-range commercial operations, real-time access to data, and simple purchase and sale of commodities and services, among others (Khan et al., 2020). As technology advances, one of its most engaging advancements is the emergence of virtual assistants (VAs), also known as digital assistants. VAs are designed to imitate human-like behaviours and assume a social identity (Mirghaderi et al., 2022). People can use their voices to communicate with their Internet-enabled smartphones and smart home devices through virtual assistant technology. The inclusion of VAs in smartphones and other devices makes them a useful digital companion. Armstrong (2021) posits that a VA is always near individuals, living in people's pockets via Google Assistant or Siri or in people's homes, via Google Home and Alexa. The widespread availability of VAs has been made possible due to advancements and innovation in natural language processing and the belief that the use of the technology will lead to a future that is more convenient, efficient, and superior for humans.

The adoption and use of VAs to carry out routine activities is comparatively low despite the widespread accessibility and speed of VAs (Dubiel et al. 2018), especially in developing countries where availability, affordability, and accessibility to technology are a challenge because of the high rate of poverty. A review of the literature showed a significant number of studies (e.g., Mirghaderi et al., 2022; Natale, 2020; Gao et al., 2018; Kiseleva et al., 2016; McLean & Osei-Frimpong, 2019) that have been carried out on the awareness and use of VAs in developed countries that are advanced in technology adoption. However, sparse literature was found on the use of VAs in Nigeria. For instance, while Oyeleye and Ademosu (2021) investigated the use of VAs on mobile devices by young people, focusing on the students of only one department in a Nigerian University, Iyinolakan (2023) explored the adoption and usage of VAs among online users in Lagos state, Nigeria. The findings of the studies suggest that VAs are increasingly being adopted by young people in Nigeria; however, the study cannot be generalised to all young people because of the limited focus. Therefore, this study was designed to broaden the scope of previous research by investigating the awareness and use of VAs in Nigeria, focusing on postgraduate students at the University of Ibadan, Nigeria. The students were considered because most are youths and technology savvy, known to be innovators or adopt easily to technology. The broad objective is to investigate the awareness and use of virtual assistants by postgraduate students at the University of Ibadan, Nigeria. The study provided answers to the following research questions: 1) what are students' awareness of VAs? 2) Do the students use VAs and what types do they use? 3) What tasks do the

students use VAs to perform? 4) What benefits do the students derive from the use of VAs? and 5) What are the challenges faced by the students while using VAs?

Literature review

Virtual Assistants are becoming commonplace in society and provide users with personalised help and simplify various tasks. A review of the literature revealed that copious studies have looked at the acceptance and use of VAs across several populations and countries. However, few studies were found relating to Nigeria. The study of Kiseleva et al (2016) on users' levels of satisfaction when using VAs was an experimental one. The experiment focused on 60 subjects, who were postgraduate students partaking in IT internships or full-time jobs and who were using VAs. The participants were recruited via email from a mailing list of the IT company, and the study was limited to only one VA (Cortana). The user studies were conducted twice; the first was carried out by instructing 20 participants to carry out simple tasks, such as asking Cortana to play a song or send a message. In the second part, participants were assigned the task of using Cortana to search for travel-related information on the Internet. Findings show that users experienced a sense of ease and contentment while utilising VAs for simple tasks like checking the weather, making phone calls, or locating places. However, users seemed to have a lower level of confidence in VAs when it came to complex tasks like booking flights, choosing hotels, and arranging rental cars for travel purposes. The study highlighted the importance of understanding users' behaviour and satisfaction when using VAs for different tasks.

Furthermore, in an extensive multi-country study conducted by Perez et al. (2018), the use of VAs in daily life was explored. The study made use of a quantitative survey by disseminating 3749 copies of the questionnaire to Internet users across seven countries, including the United States, the United Kingdom, Germany, Spain, Brazil, Argentina and Chile. The researchers focused on four VAs (Siri, Google Assistant, Cortana and Amazon's Alexa). Findings show that the highest number of online users (66.5%) who were aware of VAs were from Spain, but did not actively use them. The highest number of online users who actively adopted VAs was from the US (44.2%) and used VAs to carry out multiple daily tasks. Most users used VAs for many tasks such as setting alarms, checking the weather, and playing music. Findings also reveal varying usage patterns among participants, with some using VAs several times a day, while others rarely engage with them. Most users preferred using VAs primarily at home. Most participants expressed contentment with the performance of VAs, although a few had concerns regarding their accuracy and reliability. Privacy emerged as a concern for some participants, with some expressing worries about potential data breaches. Overall, the study sheds light on how VAs are integrated into people's lives and underscores the apprehensions associated with their usage across different countries, which do not include Nigeria. Thus, an investigation into these concerns would aid in comprehending the advantages and challenges that come with the utilisation of VAs in Nigeria.

Moreover, the study of Dubiel et al. (2018), also published around the same period as Perez et al., examined the utilisation of VAs among 178 participants who had used a voice-activated personal assistant at least once. A vast majority of VA users (76.0%) had been utilising VAs for a minimum of six months. Out of all the users, 45.0% were considered to have interacted with VAs at least once every week, while the remaining 55.0% were infrequent users who engaged with their VA less frequently. Apple Siri (32.0%) and Google Assistant (31.0%) were the most frequently used VAs by the respondents. Findings also revealed that most participants (86.0%) employed English as the primary medium of communication with the VAs, while a smaller fraction (6.0% and 2.5%) used Italian and Polish, respectively. The proportion of respondents who used assistance multiple times a day was considerably higher among the users who had used their VA for six months. Also, most respondents used VAs for simple tasks such as fact-finding queries, weather updates, or playing music, while many functions were hardly used or completely unexplored. Satisfaction with VAs varied between different user groups, with frequent users being significantly more satisfied with VAs. The findings suggest a potential link between user satisfaction and VA usage frequency. The results further highlighted some challenges to the use of VAs, as individuals who did not use assistants often had concerns about the VAs' ability to understand different accents rather than the VAs' proficiency in comprehending commands. This implies that accent variations posed an obstacle to the use of VAs. Therefore, enhancing the accent recognition capabilities of VAs could increase usage among infrequent users. Furthermore, both frequent and infrequent users shared similar privacy concerns when communicating with their VAs in different settings. However, frequent users were more willing to use VAs in front of different audiences, suggesting that the users may have developed more trust in VAs. It is also crucial to note that privacy concerns hinder VA adoption, and addressing these concerns is essential in enhancing users' trust. Overall, the findings suggest that there is a need to improve VAs, particularly for accent pattern recognition, and assurance of privacy concerns to increase use among infrequent users.

A study by Natale (2020) also focused on exploring the effects of VA (Siri) on people's perceptions of technology and their relationship with it. The study argued that VAs like Siri can create an approachable persona, encouraging users to develop an emotional connection with the technology. Natale proceeded to explain that the correlation between users and VAs is influenced by various factors, including user expectations, the design of the VAs and the socio-cultural context of interaction. Natale identified four themes in user relationships with VAs: perceiving them as friends, considering them as entities, viewing them as extensions of themselves and seeing them as sources of support. The study further deliberated upon the ethical ramifications of VAs and their potential to bolster pre-existing prejudices and inequalities. For example, VAs were often designed with a default female voice, reinforcing gender stereotypes and expectations of women as caretakers and assistants. Moreover, VAs can perpetuate established power differences by reinforcing existing social norms and hierarchies. Overall, Natale's study provided

a critical analysis of the role of VAs in shaping users' attitudes toward technology and their relationships with it. By examining the interplay between cultural and technological elements, Natale's study emphasises the importance of gaining an understanding of VAs and their impact on users' lives. However, the study only focused on Siri and did not provide comparisons with other VAs, limiting the generalisation of the findings. The research also neglected to acknowledge the possible moral concerns connected to the use of VAs, especially concerning confidentiality and protection of information. The current study builds on the findings of Natale's work by investigating the use of several VAs to gain a better understanding of Nigerian users' attitudes and experiences.

The study by Mirghaderi et al. (2022) focused on commercial VAs (mobile applications of AI-enabled VAs). It investigated users' feedback and analysed what characteristics of commercial VAs are perceived as important when users interact with VAs. A total of 26 individuals, consisting of graduates and undergraduates from the Illinois Institute of Technology, were interviewed. The interviews revealed that 15 participants preferred to use VAs in private because they believed that communicating with VAs in public was not socially acceptable. Also, 26 study participants expressed a preference for using VAs in a basic manner for completing simple tasks like asking for the weather or searching the Internet for information. Interestingly, 10 participants did not consider VAs as companions or friends, while nine viewed VAs as companions and friends, with five remaining undecided. On the other hand, 18 did not report any emotional attachments to VAs. When interviewed about the trust levels of VAs, 16 out of 26 participants who used VAs stated they trusted information received on VAs most of the time. These findings showed that participants naturally compared the abilities of VAs to those of humans; specifically, focusing on abilities such as empathy, voice quality, memory retention and interactivity. The study indicated that VAs having human-like and non-human-like traits shaped how users perceived them, resulting in either positive or negative outcomes. Additionally, the study explored people's attachment to VAs and concluded that these "attachments" were primarily driven by the convenience provided by the technology rather than their emotional needs. However, the study did not clearly state the VAs as it generalised the VAs as any "AI-enabled VAs". This gap is addressed in this study.

In Nigeria, Oyeleye and Ademosu (2021) investigated the use of VAs on mobile devices by young people, focusing on the students of the Department of Mass Communications at Caleb University, Imota, Lagos state. The research relied on a blend of techniques, including surveys and group discussions. A total of 198 survey responses were obtained, and for the focus groups, seven individuals were handpicked from the 300-level students and another seven from the 400-level students. The study was anchored on the Communication Technology Determinism Model and the Media Richness Theory. Results indicated that the respondents used VAs for communication, calls to text, information search, transmitting messages, enjoying music and easing boredom, among many others. The use of VAs made communicating with family and friends easier but

also made it easier to avoid typing out messages or numbers. The study suggested that VAs are becoming increasingly integrated into users' lives, but users' satisfaction with their performance and willingness to download the application to their devices are key factors in their long-term use. The gap in the study is the focus on only undergraduates of one university. This present study addresses this gap by looking at postgraduates at another university.

Another study conducted by Iyinolakan (2023) in Nigeria explores the adoption and usage of VAs among online users in Lagos state, Nigeria. From a population of nearly 24 million people in Lagos state, a sample size of 400 participants was selected for the quantitative survey. Interviews were carried out with nine people. The Adaptive Structuration Theory and Uses and Gratification Theory were adopted as the framework. Findings revealed that many respondents did not know what VAs were, but once they were explained to them, participants understood what VAs meant. This suggested a potential lack of awareness and understanding of VAs among smartphone users in Nigeria. Also, respondents pointed out the limitations of VAs, one of which is the restriction when it comes to understanding languages, as VAs were designed to understand certain languages (English, French, and Spanish). This posed a challenge to users who speak other languages or have accents that the VA may struggle to understand. The gap in Iyinolakan's research is the concentration on individuals residing in Lagos state, and the exclusive use of online surveys and phone conversations to gather data. This limitation means that the findings cannot be generalised to all Nigerians.

Methods

The population of this study was the postgraduate students at the University of Ibadan, Nigeria. The population of postgraduate students at the University of Ibadan as of the 2020/2021 session was 12269. The ideal sample size was calculated using Slovin's (1960) formula [n = N/1+N(e)2], where N = population size, e = acceptable margin of error (0.05) and n = sample size. This gives an acceptable sample size of 387. Slovin's formula allows a researcher to sample the population with a desired degree of accuracy and gives the researcher an idea of how large the sample size needs to be to ensure a reasonable accuracy of results (Ellen, 2022). A multi-stage sampling approach was used to select the sample. Multistage sampling allows the drawing of a sample from a population using smaller and smaller groups (units) at each stage. It is often used to collect data from a large, geographically spread group of people. It gives the researcher the flexibility to conveniently choose the most appropriate survey sample. The first stage involved a simple random sampling technique (ballot method) to select three faculties from the list of faculties at the university. The second stage also involved the use of simple random sampling (ballot method) to select two departments from each of the three faculties. The third stage involved the use of a proportionate-to-size sampling to select the students. Specifically, 45% of the population of students in the selected departments were chosen, resulting in a total sample size of 391 individuals.

A structured questionnaire, divided into four parts, was used to collect data. The instrument used was a self-constructed questionnaire with items adapted from McLean & Osei-Frimpong (2019), Dubiel et al. (2018), Tseng et al. (2019) and Oyeleye & Ademosu (2021). The items were measured on a five-point Likert scale (Strongly Agree = SA, Agree = A, Neutral = N, Disagree = A, and Strongly Disagree = SD). The instrument was validated by two lecturers at the Department of Data and Information Science, University of Ibadan. The reliability was also ensured through a pre-test among 20 postgraduate students at the University of Lagos, Nigeria. The Cronbach's alpha values were in the range of 0.70, deemed acceptable (Nunally, 1978). Copies of the questionnaire (391) were administered with the help of two research assistants. However, 368 copies were considered useful for analysis (94.0% response rate). The study adhered to acceptable ethical standards, which entailed obtaining informed consent from participants, preventing plagiarism, and maintaining confidentiality. The data was analysed using the Statistical Package for Social Sciences (SPSS) software version 20 (frequency counts and percentages).

Findings

This section presents the results of the analysis of the data which provided answers to the research questions.

Socio-demographic profile of the respondents

The results of the analysis of the demographic characteristics of the respondents show that about one-third (66.6%) were males, while 33.4% were females. A significant proportion (87.2%) were within the range of 21-30. Most were master's students (84.8%).

Students' level of awareness of VAs

Most of the students indicated an awareness of VAs. The results showed a high level of awareness of the VAs with Google Assistant (97.0%) ranked top, followed by Apple's Siri (91.0%), Chatbots (88.9%), Microsoft Cortana (80.2%), Amazon Alexa (79.3%), and Samsung Bixby (78.8%) respectively.

Types of VAs and their usage by students

The results of the frequency and percentage distribution of the level of use of VAs are presented in Table 2. Most of the students (69.0%) used Google Assistant frequently, about half (50.0%) used chatbots frequently, while fewer than 50.0% used Siri, Cortana, Bixby, and Alexa frequently. Overall, the students indicated a high level of use of the VAs. Google Assistant had the highest mean value (2.51), while Amazon's Alexa had the lowest mean value (1.74).

Table 1: Frequency and percentage distribution of the level of use of Vas

VAs	NAT (Freq/%)	NSF (Freq/%)	Frequently (Freq/%)	Mean	*SD*
Google Assistant	63 (17.1)	53 (14.4)	252 (68.5)	2.51	0.883
Chatbots	110 (29.9)	74 (20.1)	184 (50.0)	2.20	0.872
Apple's Siri	119 (32.3)	73 (19.8)	176 (47.8)	2.15	0.883
Microsoft Cortana	149 (40.5)	73 (19.8)	146 (39.7)	1.99	0.897
Samsung's Bixby	166 (45.1)	71 (19.3)	131 (35.6)	1.90	0.895
Amazon's Alexa	196 (53.3)	71 (19.3)	101 (27.4)	1.74	0.862

Note: NAT = Not at all, NSF = Not so Frequent, SD= Standard Deviation

The tasks students use VAs to perform

Table 2 presents the frequency and percentage distribution of the purpose of use of VAs. The students used VAs for various purposes, mainly for general knowledge, work-related tasks, and entertainment. In particular, however, it seems that the use of VAs concentrates on leveraging them for general knowledge purposes, as this purpose recorded the highest mean value ($\bar{x} = 3.54$). In contrast, their use to assist in turning on devices was lowest ($\bar{x}= 2.65$). This shows that most of the students have found VAs useful.

Table 2: Frequency and percentage distribution of the tasks VAs are used to perform

Purpose of Use of VAs	SD (Freq/%)	D (Freq/%)	N (Freq/%)	A (Freq/%)	SA (Freq/%)	Mean	St.D
General knowledge	73 (19.8%)	23 (6.3%)	23 (6.3%)	130 (35.3%)	199 (32.3%)	3.54	1.489
Work-related tasks	77 (20.9%)	20 (5.4%)	40 (10.9%)	127 (34.5%)	104 (28.3%)	3.44	1.477
Information about the weather updates, news briefings	80 (21.7%)	29 (7.9%)	31 (8.4%)	131 (35.6%)	97 (26.4%)	3.37	1.493
To read articles, messages, announce calls, etc.	74 (20.1%)	25 (6.8%)	59 (16.0%)	123 (33.4%)	87 (23.6%)	3.34	1.430
To increase productivity (Setting reminders, and making a to-do list)	80 (21.7%)	34 (9.2%)	32 (8.7%)	129 (35.1%)	93 (25.3%)	3.33	1.490
For communication services (sending texts, making calls)	70 (19.0%)	44 (12.0%)	65 (17.7%)	121 (32.9%)	68 (18.5%)	3.20	1.384
For entertainment (playing music, movies, and games)	85 (23.1%)	42 (11.4%)	40 (10.9%)	129 (35.1%)	72 (19.6%)	3.17	1.466
To make online purchases	105 (28.5%)	69 (18.8%)	70 (19.0%)	85 (23.1%)	39 (10.6%)	2.68	1.375
To control smart home devices (turning on lights/ACs)	97 (26.4%)	81 (22.0%)	88 (23.9%)	57 (15.5%)	45 (12.2%)	2.65	1.343

Note
SD = Strongly Disagree, D = Disagree, N=Neutral, A=Agree, SA=Strongly Agree, St.D= Standard Deviation

Benefits students derive from using VAs

Table 3 shows the level of agreement of the students with the benefits derived from the use of VAs. The table shows a high level of agreement with all the items, as all the statements had mean scores ($\bar{x}$) above 3 out of 5. Most agreed that VAs helped them complete tasks quickly than doing it manually, with a mean score of 3.56 out of a score of 5. Most also agreed that VAs assisted them in studying ($\bar{x} = 3.55$), made life easier ($\bar{x} = 3.51$), helped save time wasted in completing tedious tasks ($\bar{x} = 3.50$), fitted into their academic activities ($\bar{x} = 3.43$), helped in scheduling their time to read or set reminders for lectures ($\bar{x} = 3.38$), and to stay organised and manage tasks ($\bar{x} = 3.38$).

Challenges faced by students while using VAs

The results of the analysis of the challenges associated with the use of VAs are presented in Table 4. Many challenges highlighted were ranked by the students. The challenges are VAs sometimes misunderstanding users' requests or commands ($\bar{x} = 2.96$), privacy and security of the personal information shared with VAs ($\bar{x} = 2.81$), the inability of VA to communicate with users in the local language ($\bar{x} = 2.80$), technical issues or glitches ($\bar{x} = 2.74$), and VAs' inability to understand and accurately interpret voice commands ($\bar{x} = 2.52$), among others.

Table 3: Benefits students derived from using VAs

Benefits of Using Vas by students	SD (Freq/%)	D (Freq/%)	N (Freq/%)	A (Freq/%)	SA (Freq/%)	Mean	St.D
Help in completing tasks compared to doing them manually	63 (17.1%)	24 (6.5%)	24 (6.5%)	159 (43.2%)	98 (26.6%)	3.56	1.394
assists me in studying	70 (19.0%)	16 (4.3%)	26 (7.1%)	153 (41.6%)	103 (28.0%)	3.55	1.429
Makes life easier	63 (17.1%)	26 (7.1%)	37 (10.1%)	146 (39.7%)	96 (26.1%)	3.51	1.395
Helps save time wasted in completing tedious tasks	64 (17.4%)	19 (5.2%)	47 (12.8%)	144 (39.1%)	94 (25.5%)	3.50	1.383
Fits with my academic activities	64 (17.4%)	22 (6.0%)	54 (14.7%)	148 (40.2%)	80 (21.7%)	3.43	1.359
Helps in scheduling time to read, setting reminders for lectures, etc.)	64 (17.4%)	29 (7.9%)	50 (13.6%)	152 (41.3%)	73 (19.8%)	3.38	1.356
Helps stay organised and manage tasks	62 (16.8%)	32 (8.7%)	54 (14.7%)	145 (39.4%)	75 (20.4%)	3.38	1.354

Note: SD = Strongly Disagree, D = Disagree, N=Neutral, A=Agree, SA=Strongly Agree, St.D= Standard Deviation

Discussion

The demographic information shows that most of the respondents (87.2%) were youths in the age range 21–30. This category of students is part of the Millennial generation, also known as Generation Y or Gen Y. Gen Y is distinguished from other generational cohorts in its intense exposure to the Internet from a very young age. Many members of this generation grew up with technology and have mastered its use for many aspects of their lives, particularly for communication and entertainment. These digital natives, who are either students or relatively recent entrants to the workforce, are often described as technologically savvy and digital natives. No doubt, our results showed that most of the postgraduate students were aware of virtual assistants. This result is similar to the findings of Dubiel et al. (2018), Oyeleye & Ademosu (2021), and Perez et al. (2018).

Results also show that most of our respondents reported frequent usage of VAs, including Apple's Siri, Google Assistant, Amazon's Alexa, Microsoft Cortana, Chatbots, and Samsung's Bixby. However, it is important to note that although most of the students used the aforementioned VAs frequently, there was also a marked low usage of some of the VAs (including Amazon's Alexa, Microsoft Cortana, and Samsung's Bixby) which may be attributed to the fact that VAs like Samsung's Bixby and Amazon's Alexa are not readily available on user's devices. For example, Android phones from different affordable brands are more prevalent, particularly among students, which may account for the higher utilisation rate of Google Assistant, which is found on all Android phones. This means that most of the students may not be using expensive phones such as Apple's iPhones, which have Siri, or Samsung's devices, which have Bixby. One of the factors that affects the use and continuous use of technology is the cost attached to acquiring technology. This supports the findings of Liu et al. (2020) that the financial cost attributed to acquiring technology has a major influence on its continued usage.

Table 4: Challenges associated with the use of VAs

Challenges	SD (Freq/%)	D (Freq/%)	N (Freq/%)	A (Freq/%)	SA (Freq/%)	Mean	St.D
VAs sometimes misunderstand my requests or commands	85 (23.1%)	60 (16.3%)	49 (13.3%)	130 (35.3%)	43 (11.7%)	2.96	1.384
Concerned about the privacy and security of the personal information shared with VAs	84 (22.8%)	82 (22.3%)	65 (17.7%)	94 (25.5%)	43 (11.7%)	2.81	1.352
Inability to communicate with VAs in my local language	93 (25.3%)	68 (18.5%)	80 (21.7%)	72 (19.6%)	55 (14.9%)	2.80	1.399
Fear of using VAS for complex tasks (e.g., booking of flight tickets) due to lack of trust in VA to handle them properly	99 (26.9%)	70 (19.0%)	70 (19.0%)	81 (22.0%)	48 (13.0%)	2.75	1.397
Technical issues or glitches encountered when using VAs	82 (22.3%)	90 (24.5%)	69 (18.8%)	96 (26.1%)	31 (8.4%)	2.74	1.292
Lack of trust in the accuracy and reliability of VAs	90 (24.5%)	100 (27.2%)	81 (22.0%)	75 (20.4%)	22 (6.0%)	2.56	1.227
The inability of VAs to understand and accurately interpret voice commands	105 (28.5%)	91 (24.7%)	67 (18.2%)	85 (23.1%)	20 (5.4%)	2.52	1.270
Responses from VAs are sometimes not satisfactory	113 (30.7%)	100 (27.2%)	69 (18.8%)	70 (19.0%)	16 (4.3%)	2.39	1.224
Learning to effectively interact with a VA is challenging	110 (29.9%)	113 (30.7%)	70 (19.0%)	59 (16.0%)	16 (4.3%)	2.34	1.187
Understanding the responses provided by VAs can be difficult	106 (28.8%)	134 (36.4%)	52 (14.1%)	60 (16.3%)	16 (4.3%)	2.31	1.175

Note: SD = Strongly Disagree, D = Disagree, N=Neutral, A=Agree, SA=Strongly Agree, St.D= Standard Deviation

Furthermore, our findings show that the majority of the students used VAs for various tasks such as academic-related tasks, entertainment, information access, communication, asking general questions, and reading articles, among others. This finding is not far-fetched, as the novelty of using VAs when handling tasks cannot be overlooked. The ability to instruct a VA to perform an activity and receive immediate feedback is an advantage of VAs. The findings of this study align with those of Kiseleva et al. (2016) who found that individuals tend to be satisfied when using VAs to complete simple tasks that increase productivity. Dubiel et al. (2018) observed that their participants used VAs for entertainment and information access. Perez et al. (2018) equally observed that most VA users in the United States, United Kingdom, France, and Germany used VAs to seek information such as news, recipes, book appointments, and ask for advice, among others. Similarly, Oyeleye and Ademosu (2021) found that students utilised VAs for a variety of tasks, such as internet searches, calls and texts, and weather checks, etc., and

the respondents expressed that they chose VAs for these tasks because they found it convenient and easy to use.

Findings also show that the students derive a lot of benefits from using VAs, especially for academic activities. Most of the students found VAs helpful when completing academic and work-related tasks. They reported that VAs are effective and efficient tools used for staying organised. Furthermore, respondents expressed that they were entertained when they used VAs to complete various tasks. Supporting this finding, Yang and Lee (2019) observed that users have fun when using VAs to carry out any task. Similarly, Oyeleye and Ademosu (2021) revealed that their respondents found VAs to be effective study partners when they used VAs during study sessions. The participants found it helpful to ask VAs questions while studying until they could understand what was being studied. This shows that VAs are dependable tools that can effectively assist people with work and study-related activities.

Finally, the findings concerning challenges associated with the use of VAs showed that the students did not find it difficult to learn to use VAs. Most also expressed disagreement with the statement about finding it hard to trust the accuracy of a VA response and that they do not trust VAs to handle complex tasks. However, respondents acknowledged that VAs sometimes misunderstand language, accents or commands. Previous studies have emphasised the importance of designing VAs that can comprehend and respond to diverse languages and accents. These findings show that the students find it easy to use VAs and trust in the responses they get. These findings are corroborated by Pal et al. (2019), who observed that users will continue to use VAs if the challenges they face while using them are minimal. Similarly, Dubiel et al. (2018) observed that the more challenging it is to use a technology, the more likely users are to stop using it.

Strengths and limitations of the study

Virtual assistants are becoming popular because of the flexibility they offer with a variety of advantages, contributing to the automation of tasks and providing support for students in many activities. This study offers valuable theoretical and practical implications. It contributes to the growing literature on AI-enabled VAs, showing the level of awareness and use. The study contributes to the literature by highlighting the importance of promoting VA benefits for study and work-related tasks. It also shows that users prefer VAs for simple tasks and find them efficient and entertaining. It suggests that the cost and accessibility of VAs can impact usage. The study's findings have practical significance for VA developers to continue to promote the benefits associated with the use and the need to improve language and accent recognition, which is one of the challenges pointed out by the students.

The limitation of this study is that the respondents were limited to the postgraduate students in a university and were chosen from only three faculties; hence, the results may not be generalised to the entire university. Future studies could be extended to

undergraduate students and also students in other institutions in Nigeria. The use of only a questionnaire is also a limitation. In the future, a questionnaire could be combined with an interview or focus group discussions to have robust data on the awareness and use of VAs.

Conclusion and recommendations

The study concluded that the postgraduate students at the University of Ibadan were aware of VAs and used them for many tasks. The students derive many benefits from the use of VAs. The major challenges are VAs' misunderstanding users' requests or commands, privacy risks and security of the personal information shared with VAs, technical issues or glitches, and VAs' inability to understand and accurately interpret voice commands, among others. There is a need for further promotion of the benefits of VAs study through education and training programmes, highlighting the advantages of VAs. Developers of VAs should focus on improving the inclusion of many languages and the recognition of various accent patterns to minimise some of the challenges associated with language and accent recognition. Developers should also invest in improving the accuracy of VAs' responses and the ability to correctly interpret users' commands.

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