Adopting Virtual Assistants in Nigerian Tertiary Institutions: Benefits and Challenges.

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ABSTRACT

Smart campus allows educational institutions at tertiary level to make sound decisions that will enable them to maximize resources and improve security. The development of smart campuses is aided by some basic infrastructures such as 5G, IoT, cloud computing, AI, as well as big data analytics. Virtual Assistant (VA) and e-learning, were rapidly adopted into educational processes to reduce the need for physical contacts due to covid-19. enhance effective learning and teaching. VA has proven to be a very useful tool for effective teaching and learning in educational institutions. In this article, the roles, benefits and challenges of adopting virtual assistants in higher education institutions in Nigeria. Specific task that needed to be virtualized are also highlighted. The findings show that VA can be used to automate Level Advising for students, some exams exam officer's duties, some task performed by head of departments, academic and transcript office task, postgraduate school task and alumni relations tasks. It is also determined that VA have the potential to reduce the running costs of higher education institutions, improve teaching and learning, and reduce staff workloads. However, to achieve this goal, infrastructure such as the internet, electricity and cloud services must be improved.

Keywords: *Artificial Intelligence, Digital Classroom, E-learning, Intelligent Personal Assistants, Virtual Assistants*

1   INTRODUCTION

The demand for e-Learning has increased over the past few years. Many colleges have started creating their e-Learning systems in addition to popular open-source and corporate systems. Learning is a very complex process with many different components, including objectives, procedures, managing material and information, sharing, augmenting, and supplying. All of these elements are integrally tied to handling a certain type of learning materials and flow along with offering the required management services (Ivanova *et al.,*2017). However, to generate a successful personalized learning operation, these tangentially linked components must come together to offer the whole context necessary for tailored behavior. (Kasthuri & Balaji, 2021). With the potential to intelligently learn throughout their lifetime, virtual assistants will greatly support education advancement.

Artificial intelligence (AI) that allows virtual assistants to work autonomously necessitates meticulously defined paths and intense human supervision (Laeeq & Memon, 2021). To construct the artificial intelligence on which the virtual assistant relies, human engineers must methodically process the interactive and conversational data. The technology underpinning partially autonomous and fully autonomous virtual assistants is deep reinforcement learning utilizing CNN models (Laeeq & Memon, 2021). It's not apparent if artificial intelligence (AI) (virtual assistants) can take the role of human judgment in addressing people's personal needs, even though it can frequently complete technical jobs faster and better than humans.

Even after being accepted into college, students must complete several well-defined but difficult tasks, such as filling out course registration forms, submitting assignments and dissertations, getting immunizations, and paying tuition, to name a few (Page & Gehlbach, 2017). Many students will stumble and succumb to challenges if they are not assisted in those tasks that they find difficult. This will affect the efficiency with which they complete their tasks. Differential attrition throughout the journey to college can aggravate socioeconomic differences in educational access and degree conferment, even among students with comparable academic profiles. As a result, resolving the educational assistantship issue has significant educational and societal implications(Laeeq & Memon, 2021).

Users should be helped by customized interface components understandably and intelligently while interacting with complicated systems, such as virtual educational systems. Personal assistants are one potential remedy (Todorov *et al.,*2018). Personal assistants are not new; they have been utilized for many years in both business and personal chores. Daily duties like organizing meetings, booking hotels, groceries, and clearing bills are managed by personal assistants, among other things. Previously, only individuals could serve as personal assistants, but today an electronic gadget with learning capabilities may do so (Santos *et al.,*2018). These electronic devices' assistants often allow users to call,

exchange SMS, view their schedule, explore websites, read papers, obtain meteorological data, and a slew of other things.

The Google Assistant, Siri, Cortana, and Echo virtual assistants are just a few examples of the prominent mobile device virtual assistants that have been developed over the years and have become popular. The architecture and principles used by Google Assistant, Siri, and Cortana are comparable. The objective is to afford human interaction with the system and equipment easier and more pleasant (Zawacki-Richter *et al.,*2019). With the help of these voice assistants, customers can make bookings, and stream conferences and podcasts without needing to use their hands. Contrarily, most voice assistants need at least 1.5 seconds to comprehend a statement, and they frequently search right away for words that can't be understood contextually without additional machine intervention (Zawacki-Richter *et al.,*2019).

In this paper, the virtual assistant technology, the benefits and challenges that hinder the adoption of the technology in tertiary institutions in Nigeria were explored. This is to bring to the fore the adoption challenges with a view to addressing them and fully benefit from the technology. The paper is organized as follows: section one presents the introduction, literature review is presented in section two. The third section presents the classification of VA systems; Section 4 discussed the benefits, challenges and solutions of VA adoption. Finally, in section 5, the solutions to the challenges and conclusion were presented.

2 LITERATURE REVIEW

The educational industry has produced and embraced several digital technologies. The efficient administration of campuses and student-centered learning can be achieved by effectively integrating technologies like IoT technology, cloud computing, big data, AI, augmented and mixed reality, and others with a user-friendly system interface (Chiu *et al.,*2020). According to IBM's 2016 smart campus study, most colleges have started to track and evaluate the academic performance of students and learning activities. Analysis of data and intelligent computing can enhance students' learning opportunities. (Kasthuri & Balaji, 2021).

The absence of originality and appeal in the educational process is one of the factors contributing to a decline in interest in learning. The use of gamification and game-based learning might be effective strategies for increasing students' excitement. MATE (Multi-Agent Testing Environment), a game-based learning interface, is presently being created to be integrated into virtualized systems focused on education and learning. Another responsibility is to provide frameworks for assistants' self-improvement through education. Our next job is to provide a fully standardized environment for carrying out the suggested lifelong learning strategy, drawing on the

expertise gained from the existing iteration of the space (Ivanova *et al.,*2017).

Chiu *et al.,*(2020) noted in their case study on virtual assistants as a smart campus that; There is a need to support schools in incorporating new technologies like wearables, Mixed reality, and AI into coursework in addition to enhancing the general network infrastructure of school campuses in Taiwan at all levels. Recent developments have brought the use of IoT technologies to create smart campus solutions. To allow smart parking and intelligent classrooms on campus, it links video surveillance and other sensing components through WLAN. Other tools, such as multimedia conferences, learning resource performance, a 5G network teaching platform, and smartphone-connected campus sensors, are used to support instructional activities on campuses. (Chiu *et al.,*2020) study created a useful voice assistant powered by deep learning that can effectively take the place of conventional university-approved sites and applications. Users just have to utilize voice requests to acquire information about the campus; complex procedures are not necessary.

In (Chiu *et al.,*2020)'s implementation of a robust network-based campus virtual assistant; Because smartphones are so common, the virtual assistant appears as a chatbot. The chatbot was created as an app. The assistant is first turned on by calling wake-up words, and in the next stage of Guided Dialogue, it would offer vital guidance for using services. After then, consumers would communicate their demands to the assistant verbally during the Audio Conversation stage. The recommended module would then categorize the emotional label of the voice command. Additionally, the suggested module executes the appropriate reaction and action depending on the voice command's word embeddings and emotional label input. The virtual assistant conducts discussions and tasks following the corresponding response and action. Finally, if no additional user commands are issued, the assistance will terminate.

Ivanova *et al.,*(2017) in their research on virtual assistants focused on their role in virtual education for lifelong learning. In the virtual education system, a student is represented by his or her assistant. Users might use it to sign up for the services the digital library offers. The administration of the library receives a request to sign up for the service, and they send it to the system. It then keeps track of this registration and starts teaching the learner English. The teacher can create exam questions, which are kept in a database and used by the system. The instructor is portrayed in the VR system by their helper. The teacher can design a test or choose the problems that will be emailed to the student at random times for a certain period after the database has enough test questions. The student's aide receives a test question through the technology and must help the student envision the question and potential responses. When a student has

made a decision, their assistant enters that response into the computer, which adds it to the database along with the questions.

Todorov *et al.,*(2018); emphasized that creating an efficient interaction between autonomous intelligent components that are working in the area is a significant problem for virtual assistants in education. Their three-step strategy entailed developing a uniform, integrated technology to guarantee communicational and syntactical compatibility among various component types employed in the space and situated on various architectural levels. The next step was to enable semantic interoperability, or the capacity for semantic parts of the interaction to be supported by techniques, methods, and other means. The usage of adaptive learning virtual assistants, or the inclusion of intelligent assistants, was the final stage. Assistants that exhibit context-aware, reactive, proactive, and social behavior independent of the environment were referred to as "intelligent" in this context (Todorov *et al.,*2018).

Santos *et al.,*(2018) noted that intelligent assistants are currently able to help their users with a wide range of activities and emphasized the need of figuring out whether it is feasible to enhance their knowledge and assertiveness by leveraging new technological paradigms. He said that one potential strategy is to integrate intelligent personal assistants into IoT applications. The learning database would grow as personal assistants would be able to study data from a greater range of sources. Many user chores can be made easier with the design of smart assistants which are more independent and perceptive. It should be highlighted that bringing intelligent personal assistants to IoT contexts raises several challenges, mostly relating to technology paradigms. Making methods to facilitate communication between items in a network is one of these problems. The development of a uniform Internet of Things communication protocol was suggested as one potential remedy (Page & Gehlbach, 2017) centred on creating a virtual assistant to aid kids through the college application process. (Zawacki-Richter *et al.,*2019) outlined several domains of ai applications in institutional and operational services as well as educational support:

    I.   profiling and prediction
    II.   assessment and evaluation
    III.   adaptive systems and personalisation
    IV.   intelligent tutoring systems.

The researchers discuss the almost complete lack of rational contemplation upon these difficulties and dangers of artificial intelligence (virtual assistants in education), the tenuous link to theoretical pedagogical viewpoints, and hence the need for even more investigation of ethical and academic methods in the application of AI in university education. (Cavique *et al.,*2019) proposed a cutting-edge Virtual Assistant concept as a component of a human-machine interaction effort to improve engagement during presentations and open dialogue among the presenter and the audience (e.g., auditoriums with 200 people). The main goal of the suggested approach was to offer a framework for interaction to increase audience awareness of crucial aspects of the presentation. The combination between the speaker and the virtual assistant might increase public education in this way.

3 CLASSIFICATION OF VA SYSTEMS

Virtual assistant systems are a creative solution to provide help and guidance to students in higher education institutions. Voice-based assistants, chatbots, virtual reality, education gamification, and web-based platforms are the five primary types of these systems as shown in Figure 1. Each of these classifications was reviewed and presented in this context, emphasizing the individual strengths and limits of each method.

Voice-based assistants: These virtual advising systems communicate with students using speech recognition technology, allowing them to simply and swiftly ask questions and receive replies. This sort of method is very beneficial for students who are always on the go or want a more conversational approach, however, in comparison to the other classification slow in response (Laeeq & Memon, 2021).

Chatbots: Chatbots are conversational agents that communicate with students using natural language processing. They are meant to give quick and easy answers to common inquiries and may be implemented into websites or mobile applications. They offer a faster response time than other VA classifications (Kasthuri & Balaji, 2021).

Virtual reality: Virtual reality (VR) solutions provide students with a completely immersive experience, allowing them to see and realistically interact with content. VR may be utilized to conduct virtual tours, mimic real scenarios, and deliver interesting and interactive teaching in the setting of higher institutions.

Education gamification: This method motivates students and makes learning more exciting and engaging by using game aspects such as points, awards, and challenges. Students are more likely to stay interested and remember information when education is made more fun (Ivanova *et al.,*2017).

Web-based platforms: Web-based platforms are online platforms that offer a variety of resources to students, such as educational materials, online tutoring, and systems for tracking progress and getting feedback. This sort of system is especially beneficial for students who prefer a self-directed approach to learning and want to access information and help at any time and from any location (Page & Gehlbach, 2017).
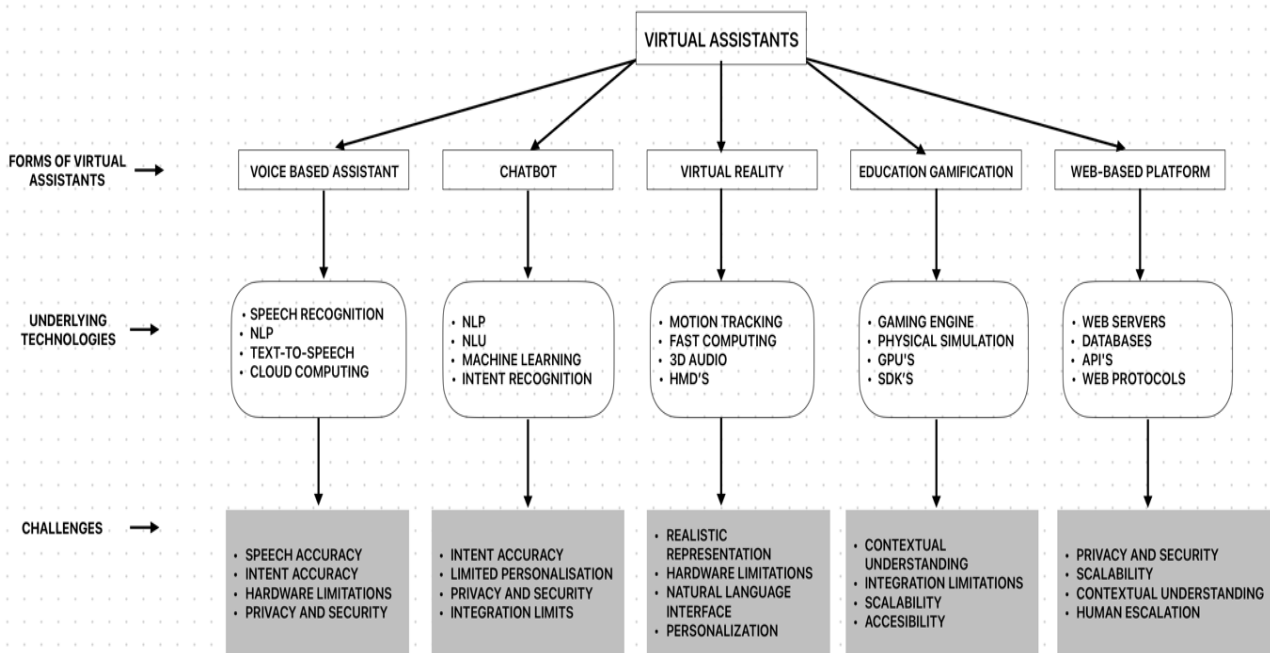
Figure 1: VA Technologies Classification

4.1 BENEFITS OF VA IN TERTIARY INSTITUTIONS

Virtual Assistants can help tertiary institutions in numerous ways. Some of the benefits include improved productivity, increased efficiency, better access to online resources, enhanced service, and improved workflow automation. Additionally, virtual assistants can provide added convenience and flexibility by allowing students to access information on their own time, without having to wait for assistance from a traditional staff member. Finally, virtual assistants can reduce costs associated with staffing traditional roles, such as receptionists or other support staff. VA can be used to automate several tasks in the universities. They include: Level Advising for students, some exams exam officer's duties, some task performed by head of departments, academic and transcript office task, postgraduate school task and alumni relations tasks. Other benefits of VA include:

Saving time: Many administrative activities, such as organizing appointments and replying to emails, may be automated by virtual assistants. This frees up time for educators to focus on more vital responsibilities like developing new course content and doing research (Haleem *et al.,*2022).

Reducing costs: Tertiary institutions can save money on employment expenditures such as salary, benefits, and training by adopting virtual assistants. Furthermore,

virtual assistants may be employed to automate specific operations, minimizing the need for extra manual work.

Facilitating effective delegation: Virtual assistants can aid tertiary educators in delegating responsibilities to students, giving them more time to focus on their research and teaching. This can also aid in the development of a more collaborative and student-centered approach to teaching (UNESCO, 2019).

Improving the organization of education assistance: Virtual assistants can be employed to help with educational tasks like grading and course scheduling (Haleem *et al.,*2022). This can serve to enhance tertiary institutions' overall efficiency, resulting in a better educational experience for students.

Constant availability: Virtual assistants are available at all times, allowing students to seek assistance whenever they need it (UNESCO, 2019). This can improve student engagement and happiness with their educational experience

Creating a sense of trust: Tertiary schools can demonstrate their commitment to giving students with the resources and assistance they need to succeed by utilizing virtual assistants. This can assist students to gain trust and motivate them to continue their studies (Haleem *et al.,*2022).

Increasing user loyalty: Virtual assistants can help to promote student loyalty to higher institutions by providing students with a convenient and dependable means to access educational resources and support (Olutola & Olatoye, 2015). This can also motivate students to

recommend the college to others, thereby increasing enrolment.

4.2 VA ADOPTION CHALLENGES

In recent times, virtual assistants have been gaining traction as a viable alternative to traditional assistants. However, the adoption of virtual assistants in tertiary institutions in Nigeria has been slow due to several challenges. These challenges include the lack of adequate infrastructure, insufficient highly trained personnel, the high cost of deploying virtual assistants, and the Phobia of change by students and staff to use virtual assistants to mention a few.

Limited access to modern technology and Technical Knowledge: Developing countries like Nigeria often have limited access to the latest technology and infrastructure, and know-how making it difficult for virtual assistants to be adopted.

Lack of awareness: Nigerian students, teachers, and administrators are not always aware of how virtual assistants can benefit their educational experience and enhance teaching and learning.

Cost of Implementation: The cost of implementation of virtual assistants in Nigeria is often too high for educational institutions to bear as most institutions look towards novel design and development of VA systems.

Limited access to reliable internet and infrastructure: Internet connectivity is often unreliable and slow in Nigeria, making it difficult to use virtual assistants. Internet infrastructure is also still lacking in several regions

Poor data security: Data security is often not a priority in tertiary institutions. This means that virtual assistants may not be able to guarantee adequate security for user data.

Cultural barriers: Cultural barriers may also be a hindrance to the adoption of virtual assistants in Nigeria. This is because students may not be comfortable with the idea of talking to a virtual assistant.

Language barrier: Most virtual assistants are designed to understand English, which can be a barrier for Nigerian students who may not be familiar with this language.

4.3 SOLUTION TO VA ADOPTION CHALLENGES

To overcome the aforementioned challenges, it is important to understand their root causes and provide solutions. Here are some potential solutions to the challenges hindering the adoption of virtual assistants in tertiary institutions in Nigeria:

Reduce the Cost of Deployment: One of the key issues hindering the adoption of virtual assistants in tertiary institutions in Nigeria is the high cost of deployment. To reduce the cost, institutions can opt for open-source virtual assistants such as Alexa or Google Home, which are more affordable than their more expensive counterparts.

Focus on Technical Knowledge: Another challenge is the lack of technical knowledge among faculty and staff. Institutions should focus on providing proper technical training to faculty and staff to enable them to capitalize on the benefits of virtual assistants.

Upgrade Infrastructure: Virtual assistants require reliable internet connectivity and access to power. To ensure a seamless experience, institutions should upgrade their infrastructure and provide a stable environment for the virtual assistant to operate in.

Provide Proper Training: Proper training is essential for the successful deployment of virtual assistants. Institutions should ensure that the necessary training is provided to personnel to ensure that they can use the virtual assistant effectively and efficiently.

By addressing these key issues, institutions in Nigeria will be able to capitalize on the potential of virtual assistants and reap the benefits that they can offer.

5 CONCLUSION

This research has provided an extended look into the current landscape of virtual assistant use in higher education, as well as potential trends that can shape academic research and development in this area. It has also drawn attention to the possibilities of applications for virtual assistants to assist learners, teachers, and executives throughout the student lifecycle. Virtual assistant technology will probably continue to be a major problem in the years to come, even if the entire impact of virtual assistant deployment on education cannot yet be completely understood. Moving forward, research should focus on the development and measuring of the impact of virtual assistant applications on the quality of education to fully understand their potential. Education administrators should also focus on providing the necessary infrastructure for the full adoption of the technology. Furthermore, more awareness is needed among the education stakeholders on the benefits of the technology.

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