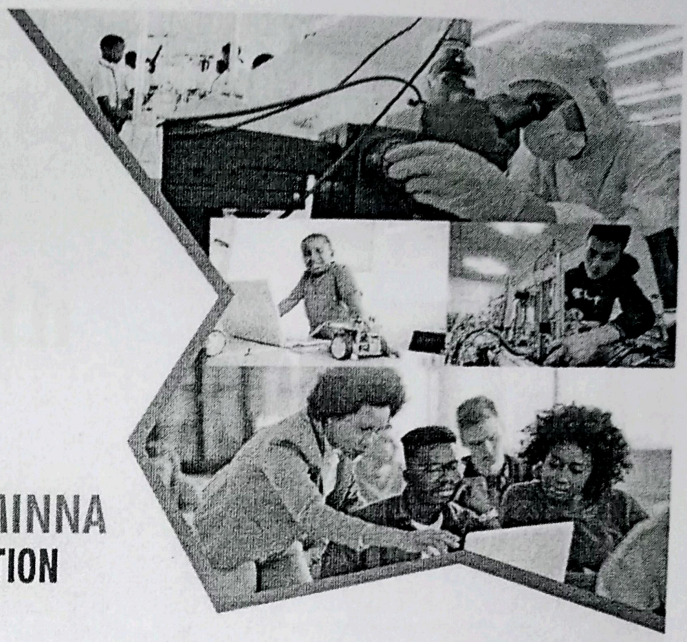

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION

9TH SSTE HYBRID International Conference

THEME:

RE-THINKING THE FUTURE THROUGH STEM AND TVET FOR ACHIEVING SUSTAINABLE DEVELOPMENT GOALS

Conference PROCEEDINGS

Monday, 2nd to Friday, 6th October, 2023

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EMERGING TECHNOLOGIES FOR TEACHING AND LEARNING IN HIGHER EDUCATION: THE PROSPECTS AND PROBLEMS OF SMART CLASSROOM

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Abstract
Smart class services have been touted as a promising tool to enhance teaching and learning interactions. Initiatives on education reformation and relevant information technology deployment have been carried out by various learning institutions worldwide. However, previous studies often overlook the user perceptions on such applications which may lead to uncertainties or failures in the implementation of smart class services as users may not always accept or adopt such technologies. This paper examines the determinants of tertiary education Lecturers decision towards adoption of smart classroom technologies for teaching in Niger state.

Keywords: Tertiary Education, Decision, Adoption and Smart classroom technologies

Introduction

The advancement of Information Communication Technologies (ICTs) and related innovations have continued to change the mode of teaching and learning at all levels of education and higher learning institutions (Eligi & Mwantimwa, 2017). The 21st century student requires learning resource using technologies thus, the need to incorporate technology in the teaching/ learning processes by teachers and all educationists to fulfill some of the expectations of the contemporary students. In this modern time several technological tools are employed by different sectors such as health, business and many others as a result of their efficiency. The education sector should not be an exception due to the role it plays in both national and human capital developments also to move with the trend of global technological advancement. Hence, the need to adopt smart classroom technologies since traditional methods of teaching are no longer effective in technology driven era. A smart classroom is a technology-enhanced learning classroom that assist the way of teaching and learning digitally. The classroom is integrated with digital displays, tabs, desktop, laptops, projectors, scanners, flash drive, iPads white boards assistive listening devices and other audio/visual components that make lectures easier, engaging and more interactive.

A smart classroom is digitally equipped classroom with a huge variety of teaching-learning method using technology. These applications have been designed to assist the teacher in lesson planning or even giving them the ability to save an online-taught class for future reference. A smart classroom aids the transfer of knowledge using technological advancement in the field of signal processing, web technologies, hardware and software. The design principles of a smart classroom are aimed to bridge the gap between students and instructor to help the instructor teach more efficiently and to make the environment more conducive for teaching and learning. The smart classroom has tools to present digital content in the form of interactive whiteboard and projectors, tools for students to effectively interact with the instructor and other students, tools for automated assessment/feedback, cameras to record and store lectures and a sensor enabled smart physical environment that controls temperature, humidity, air quality and acoustics (Saini & Goel, 2019). The smart classroom technologies and yields better learning outcomes. This is because the use of traditional classroom in teaching/learning processes are no longer sufficient and efficient to meet the educational needs of modern time. Due to increasing demand and desire for technological advancement, the education sector is not left out in her quest to employ technologies such as visualizars smartboards, laptops/computers, internet connectivity, projectors, amplifiers, speakers, podium, microphones etc, in teaching/learning process.

The use of technologies is underlined by many scholars as a necessity for improvisation quality in teaching and learning (Gebremedin, 2015). Over the past decades, government and education systems around the world have regarded the use of Information and Communications Technologies as an important issue for improving the effectiveness of teaching and learning, since the use of ICT for educational purpose yields positive outcome on the part of the students such as active learning, increased motivation, providing efficient resources and better access to information. Alsadoon (2018) asserts that the perception of an individual about the usefulness of a technology is a stronger predictor of its use. Therefore, investigating determinants of tertiary education Lecturers decision towards adoption of smart technologies for teaching can assist when trying to predict their actual use in teaching and learning activities. The usefulness of smart classroom technologies is determined by the user which in turn motivate it's adoption in the process of teaching. Smart classroom technologies used in teaching provides staff and students with opportunities to collaborate in knowledge creation and critiquing of ideas given by others which are essential factors for their adoption and integration in teaching which crucial when trying to predict their actual use in teaching and learning activities. The usefulness of smart classroom technologies is dependent on the perception of the user which will in turn determine its adoption in the process of, teaching. Smart classroom technologies used in teaching provides staff and students with opportunities to collaborate in knowledge creation and critiquing of ideas given by others which are essential factors for the adoption and integration of technologies in teaching and learning.

Tertiary institutions are expected to introduce learners to the world of technologies and their usage at the early stage (from basic to secondary School levels) before they get to the tertiary education levels. Tertiary education refers to post-secondary education received at Universities (government or privately funded). It's the next level of education for those who complete their secondary education normally is conducted at Universities and colleges. Tertiary education is the phase of education proceeding compulsory education including higher education, typically there is no upper limit to the age at which an individual can participate in tertiary education (Lambert, 2020). Tertiary education often bridges the skills and knowledge gab between the general education that an individual receives at school and work.

Educators must make effort to ensure that young learners are inculcated the knowledge of technology through teaching. Teachers must also learn to fully integrate technologies in their methodologies, use it not just as visual aids but also as tools to engage learners.

Highlights of Classroom Technologies

The Association for Educational Communications and Technology has defined technology in education as the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources. The Concept of classroom technology is incorporating into school classrooms, laboratories, lecture halls and auditoriums for the benefit of supporting teaching and learning process. In today's world, technology is a major part of our lives such that students now entering schools are already familiar with these technologies. This makes it very important for teachers to stay ahead of the learning curve when it comes to technology and it's use in the classroom. Technology can add that extra zing and excitement to any lesson, improve the learning environment by making lessons more engaging and interactive (Carder, 2021). Here are some handy devices that will take lessons to the next level:

Computers or Laptops

This is possibly the most functional and necessary piece of technology in today's classrooms. Computers are electronic devices that we use to view, store, send and receive information, not only help with presenting lessons but also with management and organization e.g, preparing lesson plans, completing grade book checking emails and making posters etc. The computer also server as the main connector to all other technology. Since the computer is a programmable machine that responds to a specific set of instruction in

a well-defined manner and it can execute a pre-recorded instruction, students can use the computer to create projects or papers and practice important skills.

Multimedia Projector

These are compact devices that project images in high resolution. They can project images, presentations or videos from a computer, laptop or document camera onto a screen or wall. The projector is the gateway to all technologies used in the classroom because it helps create a visual connection for students from a variety of devices and programs. For example, if a PowerPoint presentation about water cycle is to be prepared, the use of a projector would be highly beneficial rather than having students gather around laptop in hopes that every student can see and hear the presentation, the multimedia Projector can display the presentation on a larger scale so that all the students are able to view the information easily from multiple locations throughout the classroom.

Interactive Whiteboard

An interactive Whiteboard is basically a screen that interacts with the images one projects by touching the screen or using special markers. An interactive Whiteboard is also known as a Smart board, is an interactive display in the format of a white that reacts to user input either directly or through other devices. Standard Whiteboards have been used commonly as a way people can share messages, present information and engage in collaborative brainstorming and idea development. This technology has the ability to connect to the internet and instantly digitize tasks and operations, interactive whiteboard allows images from a computer screen to be displayed onto classroom board using a digital Projector. The teacher or students can interact with the images directly on the screen using a tool or even a finger. With the computer the computer connected to the internet or local network, teachers can access information around the world. They can do a quick search and find a lesson they used previously. The interactive Whiteboard has a powerful benefit to both the teachers and the students since it opens up the students to collaborative and closer interactions to the lesson, multimedia content can be shared and used in lectures, keeping students engaged.

Document camera

A document camera is also known as visual presenters, visualizers, digital overheads or docucams, are real-time image capture devices for displaying an object. In the classrooms, the document camera is connected to the projector and students are able to view projected items on the wall screen. A document camera for the classroom allow teachers to show documents,3-dimension objects, slides and microscopic images as well as share images with connected students over the internet. This technology is useful to teachers, administrators, classrooms, school board presentations staff meetings etc. It allows students to see text or an object from anywhere in the classroom especially for large lecture halls, removes the need for paper handouts thereby providing better ways to manage a class including the capacity to jot down note on the screen for every student to see. Document camera also give teachers the ability to put up math manipulatives in front of the entire class, review and discuss quizzes and tests.

Google Classroom

Google Classroom is a free blended learning platform developed by Google for educational institutions that aims to simplify creating distributing and grading assignments. The primary purpose of Google Classroom is to streamline the process of sharing files between teachers and students. It is a free web-based platform that integrates your G workspace (G suite) for education account with all your G suite services, including Google Docs, Gmail and Google calendar. Google classroom enables teachers to organize various tasks from a single digital location. Instructors are able to give assignments, surveys and quizzes, grade students work etc. This application saves time and paper and makes it easy to create classes, distribute assignments, communicate and stay organized (Frank, 2016). Using Google Classroom enable teachers to quickly see who has or has not completed the work and provide direct real-time feedback and grade right in classroom. Despite the availability of these technologies the determination of lecturer's decision to adopt them in teaching is checked on the basis of Unified Theory of Acceptance and Use of Technology (UTAUT) by

Papagiannidis and Marikyan, 2023. This theory examines the acceptance of technology, determined by the effects of performance expectancy, effort expectancy, social influence and facilitating conditions. The theoretical model of UTAUT suggests that the actual use of technology is determined by behavioral intention and adopting technology is dependent on the four (4) key constructs mentioned above. To provide a holistic understanding of technology acceptance, Venkatesh *et al.,* (2003) set the objective for developing a UTAUT by integrating key constructs predicting behavioral intention and use. His theory stems from different disciplines and they cast diverse perspectives on technology acceptance and adoption; ie socio-psychological research on individual behavior. This theory is represented by Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB) and Social Cognitive Theory (SCT). Based on TRA and TPB, individual's behavior is measured by the effect of attitude towards behavior, subjective norm and perceived behavioral control on behavioral intention (Ajzen, 2011). The theories are used to explore the role of perceived difficulty in performing a task, effect of group norms and attitude on accepting technology (Zhang and Mao, 2020). Social Cognitive Theory (SCT) is based on the assumption that behavioral, cognitive and environmental factors (i.e. outcome expectations-performance, outcome expectations-personal, self-efficacy, affect and anxiety) have an interactive effect on individual's behavior. It describes the influence of individual experiences, actions of others and environmental factors on certain behaviors. This theory was founded most prominently by Albert Bandura (1989) who is known for his work on observational learning, self-efficacy and reciprocal determination. The theory assumes that we learn new behaviors by observing the behavior of others and the consequences of their behavior. If the behavior is rewarded (ie positive or negative reinforcement) then, there is likelihood for such behavior to be imitated, however if the behavior is punished, imitation is less likely. The theory is an extension of Social learning that includes the effects of Cognitive processes such as conceptions, judgment and motivation on individual's behavior and on the environment that influences them (Nickerson, 2023).

The theoretical model of UTAUT suggests that the actual use of technology is determined by behavioral intention. The perceived likelihood of adopting technology is dependent on the direct effect of four (4) key constructs; performance and, effort expectancy, social influence, facilitating conditions and the effect of predictors is moderated by age, gender, experience and voluntaries of use (Marikyan and Papagiannidis, 2023).

Performance expectancy: - This is the degree to which an individual believes that using the system will help him or her to attain gains in job performance. Performance expectancy is based on the constructs of Technology Acceptance Model, (TAM), TAM2, Combined Theory of Acceptance Model (CTAM), Theory of Planned Behavior (TPB), Motivational Model (MM), Innovation Diffusion Theory (IDT) and Social Cognitive Theory (SCT). It implies that the perceived usefulness, extrinsic motivation, job fit, relative advantage and outcome expectations are the strongest predictors of use intention (Thong and Xu, 2016).

Effort expectancy: - This is the degree of ease associated with the use of the system. Effort expectancy is constructed from perceived ease of use and complexity driven from TAM, IDT. The Diffusion of innovations theory describes how new ideas, behaviors, technologies, or goods spread through a population gradually, rather than all at once. Adoption starts with innovators and early adopters, then spreads through the population to the early majority and late majority. This theory was developed by E.M Rogers, a communication theorist in 1962. It explains the passage of a new idea through stages of adoption by different people who participate in using the new idea.

Social Influence: - This is the degree to which an individual perceives that an important others believes he or she should use the new system. Social Influence is similar to the subjective norms, social factors and image constructs used in TRA ,TPB, TAM2, and IDT, they argue that the behavior of people is adjusted to the perception of others about them (Marikyan and Papagiannidis, 2023). The effect of information system (IS) is significant when the use of technology is mandated; an individual might use technology as a result of compliance requirement and not because of personal interest or preferences.

Facilitating Conditions: - This is the degree to which an individual believes that an organization and technical infrastructure exist to support the use of the system. This construct is drawn from TPB, IDT, CTAMTPB and is formed from compatibility, perceived behavioral control. The moderation effects of age, gender, experience and voluntariness of use defines the strength of predictors on intention. Age moderated the effect of all the four (4) predictors mentioned above, gender effects the relationships between effort expectancy, performance expectancy and social influence, experience moderates the strength of the relationships between effort expectancy, social influence and facilitating conditions, while voluntariness of use has a moderating effect only on relationship between social influence and behavioral intention (Venkatesh et al.,2003., Marikyan and Papagiannidis, 2023).

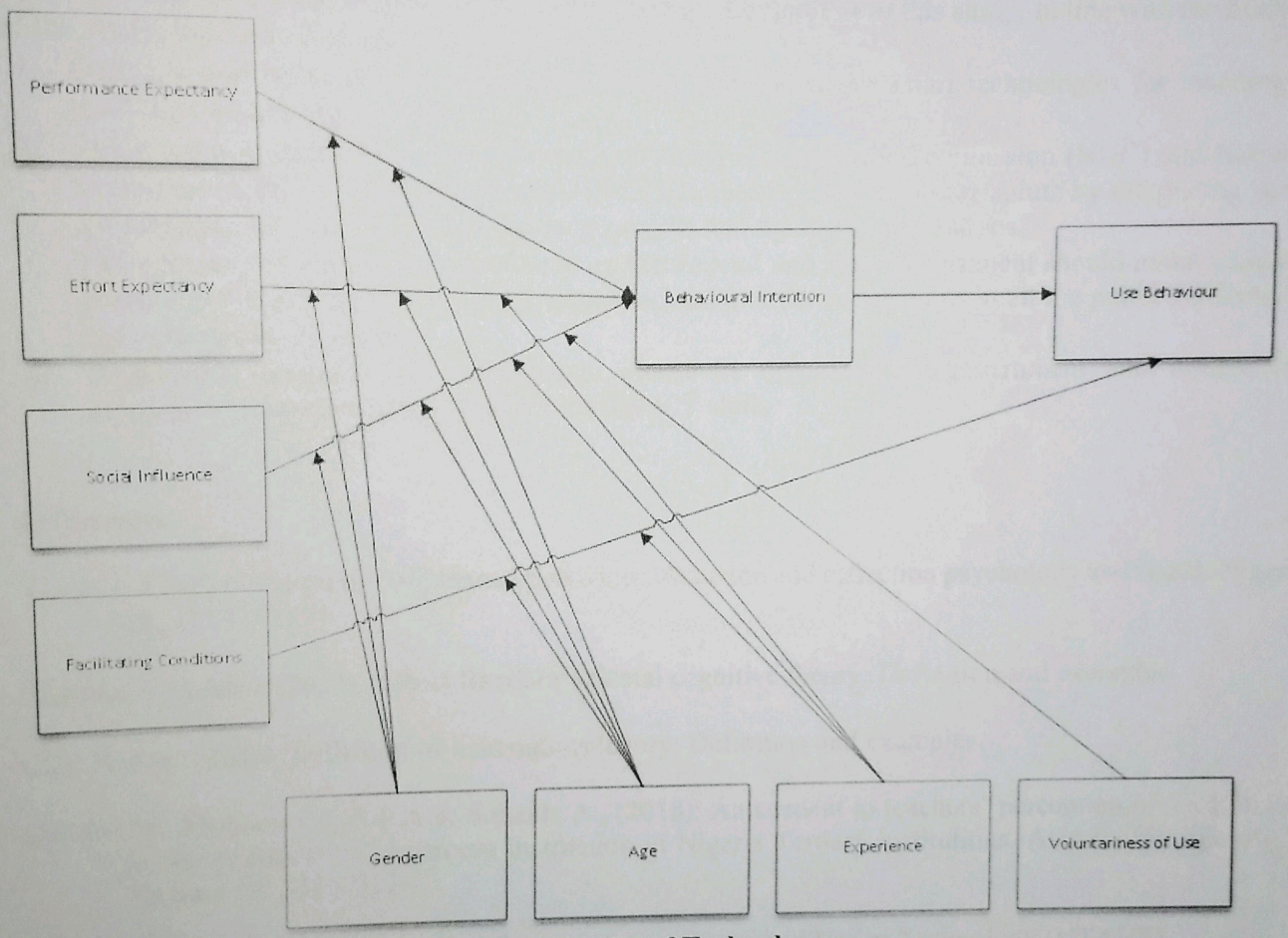

Fig 2. 1: Unified Theory of Acceptance and Use of Technology

CHALLENGES TO ADOPTION OF SMART TECHNOLOGIES

It's easy to look at all the benefits new technologies have brought to us globally and we may think "we will just buy and use the latest and greatest technologies right away in the teaching and I processes. But it's not that easy especially in large tertiary institutions due to several challenges that may hinder adoption and use of modern technologies in schools especially tertiary institutions. Some of these challenges may include:

- Legacy culture: This refers to reluctance to change among staff and management.
- Lecturers untrained on how to use new technologies.
- Price and time to procure the new tools and technologies.
- Speed of technology advances making it difficult or too hard to keep up.
- It's not easy to come up with a plan for new technology implementation.

Conclusion

In this paper, various views on the determinants of technology adoption or use by individuals (lecturers) in the classroom have been reviewed. In the course of this review, evidence has shown that although Nigeria had approved ICT policy, the country is yet to attain (100%) percent ICT compliant nation as survey found that use of technology in schools is still growing at slow rate and not all teachers and students use digital learning tools to learn every day. Equally, studies have revealed that most teachers in Nigerian institutions of learning do not have the capacity to integrate new technologies in the classroom (Umoru, 2012).

Recommendations

The following are the recommendations made based on the findings of this study; In line with the findings of the study, the following recommendations were made:

1. Colleges and other tertiary institutions should implement the smart technologies for teaching in teaching and learning process.
2. The regulatory bodies on education such as National University Commission (NUC) and National Commission for Colleges of Education (NCCE) should update their curriculum by integrating smart technologies for teaching in and learning process into the higher institutions.
3. The Ministry of Education empowered by the Federal and State government should make adequate provisions for ICT facilities, online resources, and internet connections in all the public universities and colleges of education.
4. Workshops, seminars and conferences should be organized by government and institutional authorities to equip lecturers with the needed ICT skills.

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