Extended Technology Acceptance Model and Perceived Usefulness of Virtual Reality among Deaf Students in the UAE

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ABSTRACT: This research article examined the effect of Extended Technology Acceptance Model (TAM) on perceived usefulness of Virtual Reality (VR) among Deaf students in the United Arab Emirates (UAE). The countries commit to supporting the population to achieve the same education learning outcomes and experience of deaf students and their hearing counterparts. In the UAE, the government and other partners have established inclusive schools as strategies to increase access to education among deaf students. The efforts have not been very successful as most deaf students perform low compared to hearing learners. The problem is worsening with the increasing number of deaf learners worldwide and in the UAE. As a result, the study determined how deaf learners embrace VR training strategy. The researchers employed a cross-sectional research design and through the use of Documentary Reviews, literature was reviewed thematically and analysis was done using Content Analysis technique. The findings of the study elaborated that the Extended TAM can improve the perceived usefulness of Virtual Reality (VR) among Deaf students in the UAE. This is because the Extended TAM has the capacity to present real scenarios to learners for better Knowledge and skills acquisition. The researchers concluded that Modernization of technology has contributed to diverse methodologies of teaching. Technology has improved learning from reactive and passive to interactive erudition environment because information is more accessible, exciting, and pleasurable. Researchers use Extended TAM as an online learning application to improve explanatory power for learners. The researchers recommended that government should augment on the Budget for training the instructors on how to use the Modern Technology in Teaching and Learning processes including Extended Technology Acceptance Model and use of Virtual Reality. This can help improve the conditions of learning for Deaf students in the UAE.

KEY WORDS: Extended Technology Acceptance Model, Virtual Reality, Deaf Students, UAE

I. INTRODUCTION

Since the 21st century, the education sector has experienced many transformations, especially in applying technology to learning and teaching. Today, virtual reality (VR) has become a significant system in enhancing teaching and learning because of its appeal to using real-world examples and engaging learners (Gao & Li, 2022). VR is the simulation of an environment in 3D that is used to support interaction with the content. The technology promises learner engagement, student-centered learning, and interaction with the content. One of the areas that VR could help is teaching deaf students who feel excluded due to barriers within a learning environment. Hearing loss is one of the significant disabilities that affect teaching and learning approaches due to its impact on cognition, communication, isolation, and loneliness (World Health Organization (WHO, 2020). Teachers find it hard to have the most beneficial pedagogical style to address such limitations. VR is a promising technology in supporting a training style to serve deaf students in meeting educational goals (Yu, 2022). The technology ensures multi-sensory teaching and learning that would keep deaf learners engaged and active and improve their cognition. VR has been effective in other domains, such as training hearing students in different categories, such as medicine, with improved learning outcomes and experiences. Similar benefits could apply to teachers and learners in classes for deaf people.

Since the release of the United Nations Universal Declaration of Human Rights (UDHR) in 1948, countries have been legislating to have education for all, regardless of socio-economic and health status. For example, the United Arab Emirates [UAE] legislated in 2006 to protect and support disabled people (Alyoubi & Yamin., 2021). All groups, including adults, youths, and people with disabilities, have the right to education. Societies view education as their backbone due to its impact on health, knowledge, skills, and wealth. Deaf people are among the populations receiving significant consideration, especially in the UAE. Modernization of technology has contributed to diverse methodologies of teaching (Chi-Yuan, 2022). Technology has improved learning from reactive and passive to aggressive and interactive because information is more accessible, exciting, and pleasurable (Flynn, 2020). Teachers can share information nationally and globally using technology. Educators find it easy to impart knowledge because technology offers various digital tools to explain concepts. Instructors

can engage learners in advanced, reasonable, and unique, up-to-date information from the internet, online resources, digital libraries, and research materials from various parts of the world. Thus, technology has helped to reduce the tiresome process of sourcing many physical materials. Also, using micro learning and attractive info graphics and videos have created a wide range of information compared to books. Due to increased sources of information, students can solve critical and complex tasks quickly (Hoi, 2020). Technology has improved learners' communication and collaboration skills through educational software, simulations, and multimedia. Also, teacher-learner relationships have been enhanced through interactive education platforms, such as discussion forums and video conferences globally. Learners can learn at their own pace while using videos and re-watching, playing, and pausing complex information until the idea is clear. Globally, technology is evolving, and incorporating technology in the learning environment enables learners to acquire digital skills that will benefit their future careers. Learners with digital skills will have an added advantage in the workforce. Technology has helped learners source information and link with peers and experts worldwide. Technology has incorporated learners with disabilities into learning. Approximately 87% of visually impaired learners confirm to be using modern technology devices (Rogers, 2003). Another technology that has become significant in addressing learning and teaching challenges for children with disabilities is VR.

Despite the drawbacks, the VR training strategy is promising in serving deaf learners' limitations. VR is a digital environment that provides an interactive three-dimensional [3D] simulated world to give objects spatial presence (Teo. 2019). The technology is an advancement from the 3D computer modeling that supports more distance from the physical environment among users. VR further differs from traditional 3D graphics, where people work and interact with things or objects instead of their images (Unal & Uzun 2021). As a result, people can have a closer experience of the content or objects and access deeper information from multiple senses. The virtual scenarios allow simulated interaction in a multi-sensory way because of the presence of a near-actual thing. Interaction is an essential aspect of the virtual space. Users navigate and engage the 3D space to manipulate the objects.

VR has developed and matured to ensure productive application in education and training. Integrating VR and education training strategies supports efficient and effective teaching approaches with support for learners (Teo, 2019). VR offers additional benefits beyond traditional teaching, where educators use slides, audio, or graphics on the wall. The benefits include learning by doing, immersion, interactivity, and motivation (Teo, 2019). Such features are critical to deaf students whose social isolation, cognition, and communication skills interfere with interaction with learning materials.   Scholars have been using TAM to investigate the usability of various educational technologies. TAM was first proposed by Fred Davis in 1986 in his doctoral thesis. TAM is an information system purposed to explain the acceptance and utilization of technology in teaching and learning places. It is used to analyze factors that affect learners' use of technology (Bagozzi, 2020)   The UAE has made strides in developing inclusive schools in the K-12 section that accommodate learners with disabilities, including hearing loss (Alasim, 2018). Another development is a shift from using the phrase "people or individuals with disabilities" to "People of Determination" (Bagozzi, 2020). The development is a strategy to change how society views people with disabilities and develop educational support strategies. In this spirit, the Zayed Higher Organization for People of Determination, the Ministry of Education, and Al Ain University have partnered to support hard-to-hear and deaf students toward achieving undergraduate certificates (Alyoubi & Yamin., 2021). The partnership aims to ensure the development of effective training methods and the availability of resources needed to teach deaf students.

Despite this determination, the UAE faces challenges in accommodating deaf students in education. For example, the government has been developing inclusive classrooms to enhance learning for disabled people (Alasim, 2018). Al Ain University is considering separate classes for deaf learners, arguing the effectiveness of the arrangement that incorporates an interpreter (Teo., 2019). The differences in training strategy within the country imply a limited understanding of the best approach to enhance the learning experience and outcomes among deaf students. The UAE also faces resource problems, including the human need to teach deaf people. Few teachers have the needed training, including interpretation.

II. METHODODOLOGY

The researcher used ideas from related literature and based on the Descriptive cross-sectional research design. The study was carried out with the triangulation it deserved in order to maintain the rigor of the study. . The researcher employed cluster and purposive sampling strategies to choose the documentary reviews to belong to the research study. Themes and sub-themes were used for easy flow of evidence along a story line manner.

III. RESULTS

LITERATURE REVIEW

Extended Technology Acceptance Model in Educational Technologies : Extending the TAM has become a common research approach to investigate technology acceptance in different contexts, especially in education. Lin and Yu (2023) defined extended TAM as a model with new constructs. As a result, an extended TAM has more than three original constructs. According to Lin and Yu (2023), researchers use extended TAM to improve technology explanatory power in different fields. Researchers have been adding constructs related to cognitive, social, individual, and psychological factors. In one of the studies, Wang et al. (2022) extended the TAM by adding personal investment, relevance, and perceived security to investigate acceptance of an online learning application among learners. Zhang and Yu (2022) added psychological factors to TAM, including emotional stability, perseverance of effort, and openness. Luo et al. (2021) added controlling and social tools to TAM in different research. A few studies reveal the trend in applying extended TAM to improve the predictive power of educational technologies.

Perceived Enjoyment : Based on Salloum et al. (2019), learners' awareness that using technology is entertaining motivates them to interact with it. Perceived enjoyment is an internal willingness that drives a person to put more effort into technology upon enjoying it. On the contrary, perceived enjoyment is affected by perceived ease of use and usefulness (Humida et al., 2022). Besides, Hunde et al. (2023) referred to perceived enjoyment as the extent to which using a certain technology is imaginary to be enjoyable the way it is, regardless of any consequences from the system used. Also, the scholar discovered that perceived enjoyment affects learners' behavioral intentions. The extent to which the action of using a specific system seems enjoyable and accurate, regardless of any consequences ensuing from the system (Unal & Uzun, 2021). Basuki et al. (2022) state that perceived enjoyment mainly affects people's intentions to use the technology. The WeChat payment technology in China also confirmed that perceived enjoyment involves people's intentions to use technology. Additionally, the research showed that perceived enjoyment is determined by perceived ease of use (Basuki et al., 2022) referred to perceived enjoyment as a condition that a person using technology creates that increases their comfort and pleasure in video games.Furthermore, Basuki et al. (2019) measured perceived enjoyment using playing games and involved children, resulting in very enjoyable games. Also, a sense of comfort and happiness while using technology makes the person perform their job effectively. Perceived enjoyment is an individual perception that using technology to plan and complete a certain task is enjoyable despite any challenges associated with the system (Yang et al., 2021).

Performance Expectancy : Luo et al. (2022) defined performance expectancy as the degree of easiness and conveniency of accessing, adopting, and utilizing technology. Based on Hunde et al. (2023), performance expectancy is the extent to which students believe using an e-learning system will benefit them by improving their learning performance. Furthermore, the studies showed that students' performance expectancy was influenced by behavioral intention to use technology (Hunde et al.,2023). According to YU et al. (2022), performance expectancy is the degree to which persons feel that using technology would be helpful to their work. Latief et al. (2022) is the extent of using technology to acquire some gain in specific activities. Dindar et al. (2021) found that experienced and inexperienced teachers determined their efforts by their future performance expectations. Also, the scholars added that teachers were directly affected by effort and performance expectancy in technology acceptance. Performance expectancy is the degree to which a person trusts that using a particular technology will help attain a specific goal (Unal & Uzun, 2021). Batucan et al. (2022) agreed with other previous scholars that performance expectancy improves as learners gain more experience in e-learning, which is similar to perceived usefulness. People's positive attitude that using technology will improve their performance contributes to them using it more often (Batucan et al., 2022). Based on Mallya et al. (2019), performance expectancy is weak in women but more substantial in men. "Performance expectancy was the strongest predictor of attitude ($\beta = .32$)" (Hoi, 2022). Hoi (2022) defined performance expectancy as the level at which a person believes incorporating the new technology improves their job performance. On the contrary, Al-Anezi and Alajmi (2021) had a negative result, stating that teachers and learners found adopting the E-learning system in their teaching challenging. Additionally, learners believed that technology would be exciting and beneficial in helping to attain high performance.

Self-Efficacy

Teo (2019) defined self-efficacy as a personal judgment on one's ability to achieve a certain goal; it does not align with having the actual skill but the belief that one possesses. Humida et al. (2022) were other scholars with similar ideas on self-efficacy since they referred to personal judgment on the capability to do a certain task using a computer. Among the predictive factors, self-efficacy is the most effective measure (Granić, 2022).

Additionally, self-efficacy inspires and directly affects e-learning (Granić, 2022). Furthermore, Cardenas et al (2022) found that learners have confidence in their competence to organize and perform various tasks, mostly using technology to improve their performance. Luo et al. (2022) refer to self-efficacy as a personal evaluation of the ability to complete a certain objective to produce different results. Self-belief in having the skills to organize and execute the progress of an action required to accomplish prospective conditions (Mallya et al., 2019). Mallya et al. (2019) added that independent students mostly had high self-esteem. Furthermore, self-efficacy is one's own belief in the capability to use a computer. Also, it is a personal external control belief in the capability to use computer technology (Unal & Uzun, 2021). According to (Yu, 2022), it is an individual idea to have the necessary power over personal motives and the social environment to achieve specific performance standards. Research by Dindar et al. (2021) showed that self-efficacy affected teachers' attitudes toward using and accepting technology. Moreover, Dindar et al. (2021) defined self-efficacy as teachers' self-discernments about their ability to incorporate technology for effective academic activities.

Types of Virtual Reality : Virtual reality (V.R.) is an interactive experience that immerses the user in a digital environment through a sense of presence (Fabris, 2019). Virtual reality allows for the visualization and interaction of digital representations of dynamic features and complex concepts, providing an interactive learning experience that can potentially improve student outcomes in biomedical science (Matta, 2022). V.R. are categorized in different forms based on their function and technological advancement, where they might be worn on the head or through display options (Musa, 2022). Non-immersive. VR is a computer-generated environment that presents total immersion in the 3D digital world (Sweetser et al., 2020). Semi-Immersive. VR platform is mainly used to present a state of knowledge in a particular field of science, supporting the students with acquiring theoretical knowledge (Elmqaddem, 2019). Immersive Virtual Reality. VR technology is increasingly seen as a promising opportunity to innovate online teaching and Learning in higher Education (Shields & Whetsell., 2017).

IV. DISCUSSION

It was revealed that researchers use extended TAM to improve technology explanatory power in different fields in order to impart knowledge and skills among the deaf learners in the UAE. This finding was in accordance with the study conducted by Lin & Yu (2023) on Use of Technology in Education in China who found out that utilisation of technology in teaching and learning process aids student comprehension. It was indicated that the application of Extended TAM may improve the predictive power of educational technologies in the interaction between learners and instructors. This finding was not in agreement with the study conducted by Al-Oudat & Altamimi (2022) on Virtual Reality in Education in Morocco who found out that deficiencies in Teacher training in e-learning can be a stumbling block for learner comprehension in education. It was showed that in contrast to the traditional means of studies , where a student used to have a physical limitation to their learning ability with the technological changes, learners have full access to Virtual Reality which has improved their learning skills and educational transformation . This finding was in consonance with the study conducted by Soliman et al (2021) on Virtual Reality Utilization in education in Ghana who found out that if learners have good practical knowledge on use of Virtual Reality, they can end up attaining better performance in colleges. It was revealed that in addition, the Virtual Reality training strategy can support a problem-based learning approach, where learners are encouraged to use their imagination and role-play to generate their understanding of the content. This finding was contrary to the study conducted by Alyoubi & Yamimi (2021) on Diffusion of innovation Theory in Bangladesh who found out that the background of learners can hinder the acquisition of knowledge and skills in their education career.
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V. CONCLUSION

Modernization of technology has contributed to diverse methodologies of teaching (Yu, 2022). Technology has improved learning from reactive and passive to aggressive and interactive because information is more accessible, exciting, and pleasurable (Pang, 2021). Teachers can share information nationally and globally using technology. Educators find it easy to impart knowledge because technology offers various digital tools to explain concepts. Instructors can engage learners in advanced, reasonable, and unique, up-to-date information from the internet, online resources, digital libraries, and research materials from various parts of the world. Thus, technology has helped to reduce the tiresome process of sourcing many physical materials.

POLICY IMPLICATION. : Government should augment on the budget for purchasing digital materials for schools and training the instructors on how to use the Modern Technology in teaching and learning processes

including Extended Technology Acceptance Model and use of Virtual Reality. This can help improve the quality of education in the UAE.

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