University of Hormozgan

Iranian Journal of Educational Research

Print ISSN: 1735 - 563X Online ISSN: 2980 - 874X

Homepage: http://ijer.hormozgan.ac.ir

Educational and Behavioral Research Center

Investigating the Impact of Learners' Hedonic Motivation on Their Willingness to Adopt Extended Reality Technology in Education: Approach UTAUT2

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Article Info

Article type:
Research Article

Article history:
Received 02 Sep. 2024
Received in revised form 14 Jan. 2025
Accepted 20 Apr. 2025
Published online 01 Mar. 2026

Keywords:
Extended reality,
Virtual learning environments,
Education,
Hedonic motivation,
Technology acceptance

ABSTRACT

Objective: This study examines how learners' hedonic motivation influences their willingness to adopt extended reality (XR) technologies in educational settings. Using the Unified Theory of Acceptance and Use of Technology (UTAUT) framework, the research seeks to clarify how enjoyment shapes students' attitudes and intentions toward XR adoption.

Methods: The research employs an applied, correlational design. The study population consisted of students from Kashan University of Medical Sciences during the 2022–2023 academic year. Based on the Krejcie–Morgan formula, a sample size of 384 was required; ultimately, 391 valid online questionnaire responses were collected. Data were analyzed using structural equation modeling (SEM) via SmartPLS version 3.

Results: Findings indicate a significant positive relationship between learners' attitudes toward augmented reality (AR) technology and their intention to use it in education. Perceived ease of use, facilitating conditions, habits, and particularly hedonic motivation emerged as key predictors of adoption. Additionally, expected performance, social influence, and price value were identified as important factors influencing learners' attitudes toward XR technologies.

Conclusions: The results suggest that incorporating AR technology into educational curricula can meaningfully enhance teaching quality and learning experiences. To encourage widespread adoption, institutions must address economic constraints and prioritize user-friendly designs. The study underscores the importance of developing interactive, engaging educational content and highlights the need for a comprehensive strategy to support seamless integration of XR technologies into education.

Cite this article: Nazemi bidgoli, A., Hatefi Afshar, L., Bagheri Ragheb, G. & Sadeqi Arani, Z. (2026). Investigating the impact of learners' hedonic motivation on their willingness to adopt extended reality technology in education: Approach UTAUT2. *Iranian Journal of Educational Research*, 5 (1), 1-20.

. DOI: https://doi.org/10.22034/5.1.1

Publisher: University of Hormozgan.
DOI: https://doi.org/10.22034/5.1.1

Introduction

Over the past decade, extended reality (XR), encompassing virtual reality (VR), augmented reality (AR), and mixed reality (MR), has emerged as a transformative technology, significantly altering human experiences. These technologies have pioneered new educational frontiers by creating rich, interactive learning experiences through the seamless integration of real and virtual worlds (Yang et al., 2022). Virtual reality immerses users in a simulated environment that replicates a real-world setting (Scavarelli et al., 2021), while AR superimposes virtual objects onto real spaces, enabling interaction between the two (Kim et al., 2024). Mixed reality, a convergence of virtual and augmented realities, synthesizes information from both realms (Dhillon & Tinmaz, 2024).Ultimately, XR unifies these technologies, allowing users to engage in simulated environments that merge with the real world (Jagatheesaperumal et al., 2024).

This advanced technology, characterized by its exceptional flexibility, facilitates the creation of practical and engaging educational experiences, particularly in teaching and learning contexts (Waisberg et al., 2024). By leveraging XR technologies, virtual learning environments foster group collaboration, creative thinking, and the social construction of meaning. These features enhance learners' motivation and engagement, making education more interactive and impactful. Moreover, XR tools provide personalized learning experiences tailored to individual preferences and needs, as evidenced by their ability to incorporate visual supports such as images, real-world modeling, and videos—effective, evidence-based methods for enhancing learning outcomes (Rajabiyan Dehzireh et al., 2017; Rudnicka et al., 2024).

Further, the integration of XR into educational frameworks facilitates the combination of text, images, and videos within physical environments, creating immersive learning spaces (El Shemy et al., 2024). Learning through these technologies is particularly engaging for learners, as it empowers them to control their learning, independently access information, and maintain focused attention (Baabdullah et al., 2014). It is important to note that users are more likely to accept and engage with technology when it is enjoyable and allows for anxiety-free interaction (Chang, 2013). User enjoyment refers to the intrinsic value and attractiveness people experience during fun activities, driving them to seek personal satisfaction and pleasure rather than extrinsic rewards (Cicchirillo, 2024). Alalwan et al. (2018) assert that the appeal of activities can positively influence satisfaction and behavioral inclination among Saudi users toward mobile internet usage. (Alalwan

et al., 2018).Manis and Choi (2019) explored the adoption of virtual reality technology and posited that the appeal and enjoyment of this technology play a crucial role in enhancing satisfaction and the willingness to use it(Manis & Choi, 2019). Lu et al. (2009) demonstrated that the sense of enjoyment derived from using instant messengers (IM) is linked to the behavioral intention to continue using them. (Lu et al., 2009). In their study on the factors affecting users' willingness to persist in using social networks, Samar Mouakket (2015) examined the impact of pleasure on this persistence. The findings affirm a notable correlation between deriving pleasure from social networks and the inclination to use them continuously(Mouakket, 2015).

Insights on technology adoption and participation are central to learning technologies using extended reality (XR). It helps to enhance the approach to teaching and explains the interactions with the web. In the area of health and health promotion, the study has centered on the best ways of developing education in order to foster health literate communities and a healthy culture (Salcedo et al., 2022). The combination of XR technologies in education and health education in particular is critical to understanding as these technologies improve the user experience and learning engagement. Thus, knowing how enjoyment of XR impacts the learning results it will be easier to create healthier lifestyles among students. It is most relevant in situations where health education is a key determinant of people's beliefs and health related practices (Carney & Kong, 2017; Green & Kreuter, 2005) In Iran, the current state of health education indicates that significant improvements are necessary. Although the importance of health education is acknowledged, the literature review in this study reveals several issues related to ineffective educational interventions that hinder the transfer of health knowledge into practice. This underscores the necessity for innovative approaches to health promotion (Abotaleb & Heshmati, 2016; ALAH et al., 2005; Baradaranrezaei M, 2007; Heshmati et al., 2012; Heshmati et al., 2014; Kianian et al., 2014). By integrating the enjoyment of XR technologies with health education strategies, there is potential to enhance engagement and foster behavior change among individuals, improving overall health outcomes.

Research findings indicate that the quality of education provided to certain segments of the population, such as pregnant women, was deemed satisfactory in only 27.9% of cases (Baradaranrezaei M, 2007). Moreover, only 13% of the target community possessed adequate health knowledge (ALAH et al., 2005).According to experts, educational initiatives in health and

disease prevention hold the greatest potential for reducing disease rates, mortality, and exorbitant treatment costs. These initiatives are regarded as the most promising avenue for enhancing the long-term quality of life and health of populations (Galvani et al., 2020). Therefore, the incorporation of health education expertise into the country's healthcare system is crucial. This is particularly important given that the absence of a robust and institutionalized education system in the health sector has perpetuated various challenges. In Iran, the top ten causes of death include heart disease, strokes, traffic accidents, illnesses linked to high blood pressure, diabetes, chronic lung conditions, stomach cancer, and kidney failure (Heshmati et al., 2020).

In the review conducted by Seyed Mohammadreza Mohajeri et al., the significance of utilizing extended reality (XR) and related technologies in medical sciences is thoroughly explored. The review highlights the benefits of incorporating simulations into medical education, which include enhancing patient health and safety, reducing medical errors, and lowering treatment costs (Mohajeri & Seyed, 2010). Similarly, Shahmoradi and her colleagues concluded that the use of XR technology as an auxiliary tool is increasingly effective in enhancing education, treatment, and prevention within the health sector (Ahmadi et al., 2019).

In recent years with the help of advanced mobile and tablet technology along with the increasing possibilities of the XR applications, integration of these technologies in the health sector has a possibility of expanding the possibilities of health education and positive health behaviors (Iatsyshyn et al., 2020). In order to investigate the effects of these immersive technologies on user engagement and behavior modification, this study focuses on how XR technologies can be successfully incorporated into health education frameworks. To this end, the present study uses the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2). This model, introduced by Venkatesh et al. in 2012, enhances prediction accuracy compared to the original UTAUT model by integrating three new elements: These include hedonic motivation, price value and habit. Therefore, by including these elements in the model the UTAUT2 model will provide improved prediction in the context of the adoption and usage of technology for XR in the health education field. The UTAUT2 model encompasses several factors, including expected performance, expected effort, social influence, and facilitating conditions, and is regarded as an effective tool for assessing users' acceptance and utilization of new technologies (Venkatesh et al., 2012). These factors play a crucial role in shaping intentions and behaviors related to the use of new

technologies. The UTAUT2 model is a useful tool for understanding technology adoption in health science education. It considers individual and contextual factors, including hedonic motivation, which emphasizes intrinsic enjoyment of technology use. This is crucial for assessing learners' willingness to engage with extended reality (XR) technologies. The study aims to explore how hedonic motivation, along with other factors like effort expectancy and social influence, influences learners' readiness to adopt XR. So this research seeks to fill existing knowledge gaps and provide actionable insights for enhancing the integration of these technologies into health education frameworks in Iran. The hedonic aspect is particularly relevant in health science education, where positive emotional responses can significantly influence adoption decisions. Thus, UTAUT2 is an effective lens for addressing research questions and achieving objectives. This review aims to provide fresh insights aimed at enhancing and optimizing educational experiences through innovative technologies within the realm of health sciences. The proposed conceptual model of the research is presented in Figure 1.

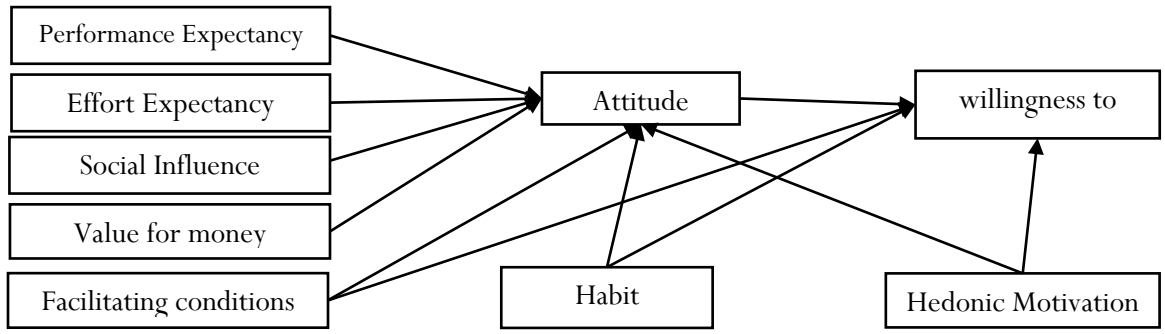

Figure 1. Structural model of the research

Material and Methods

The present study aimed to explore the impact of learners' Hedonic Motivation on their acceptance of extended reality technology in health science education, utilizing the UTAUT approach. This study employed an applied-descriptive research design, specifically adopting a cross-sectional approach. The statistical population for this study comprised all students at Kashan University of Medical Sciences during the academic year 2022-2023. A non-probability sampling method was

employed, and based on the Krejci-Morgan formula, 384 participants were needed for the research sample. After distributing an online questionnaire, 391 responses were collected and analyzed. This research comprised a total of 38 questions. Among these, 3 questions focused on gathering demographic information, while the remaining 35 questions covered ten essential performance variables: expected performance (four questions), expected effort (four questions), facilitating conditions (four questions), social influence (three questions), attitude (four questions), willingness to use (three questions), perceived value (three questions), habit (four questions), and Hedonic Motivation (three questions). The Likert questionnaire utilized a five-point scale, ranging from "completely disagree" (1) to "completely agree" (5).The reliability of the questionnaire was confirmed, with Cronbach's alpha values for all constructs exceeding 0.7, indicating satisfactory internal consistency. Ten academics with expertise in health education and sports administration were shown the questionnaire in order to evaluate its face validity. The items' comprehensiveness, relevance, and clarity were evaluated by the experts. Minor changes were made to the questions' phrasing and alignment with the study's goals in response to their input. This procedure made sure the tool was suitable and intelligible for the intended audience. Data analysis and testing of research hypotheses were conducted using structural equation modeling (SEM) with Smart PLS version 3 and SPSS software (Version 22).

Ethical Considerations

The study followed ethical guidelines to protect participants' rights and data privacy. Participants were informed about research objectives, voluntary participation, and the right to withdraw without consequences. Electronic informed consent was obtained, emphasizing understanding and agreement. Data confidentiality was ensured, with anonymized responses stored securely and used solely for academic purposes.

Results

In Table 1, the demographic characteristics of the research samples are presented.

Table 1. Description of the demographic characteristics of the research samples

Variable		Percentage of relative Frequency	Frequency
Gender	women	0.64	254
	Men	0.35	137

Age	20-30 years	0.48	191
	31-40 years	0.31	125
	41-50 years	0.19	75
Education	Bachelor	0.45	176
	Master	0.47	184
	Doctorate	0.7	31

The results of the demographic description in this research indicate that out of the 391 participants, the majority were female (254 individuals), aged between 20 and 30 years (191 individuals), and pursuing a bachelor's degree (176 individuals). To assess the internal consistency of the questionnaire constructs, both Cronbach's alpha and composite reliability indices were utilized. The convergent validity was evaluated using the average variance extracted index. The researchers noted that the measurement model is considered homogenous when the absolute value of the factor loadings of observable variables is at least 0.7; however, some researchers accept a minimum of 0.4 and recommend removing variables with factor loadings below 0.4. The results presented in Table 2 demonstrate the satisfactory utility of the variables.

Table 2. Convergent reliability and validity coefficient and Cronbach's alpha of research variables

Variable	Factor load	Alpha ≥ 0.7	CR ≥ 0.7	AVE ≥ 0.5
Attitude	0.849	0.870	0.911	0.720
	0.796			
	0.900			
	0.847			
Effort Expectancy	0.848	0.843	0.895	0.681
	0.856			
	0.838			
	0.755			
Facilitating conditions	0.823	0.815	0.877	0.641
	0.806			
	0.801			
	0.772			
Habit	0.866	0.859	0.904	0.701
	0.836			
	0.793			
	0.852			
Hedonic Motivation	0.906	0.752	0.847	0.650
	0.937			
	0.816			
Expected performance	0.909	0.893	0.925	0.756
	0.872			
	0.800			
	0.893			
Value for money	0.832	0.812	0.888	0.725
	0.851			
	0.871			

Social influence	0.908	0.858	0.914	0.779
	0.841			
	0.898			
Willingness to use	0.889	0.862	0.916	0.784
	0.877			
	0.891			

Furthermore, to assess divergent validity, the Fornell and Larcker indices were calculated. According to Fornell and Larcker, divergent validity is deemed satisfactory when the average variance extracted for each construct exceeds the shared variance between that construct and others in the model. The results displayed in Table 3 confirm the adequate divergent validity of the research variables.

Table 3. Divergent validity of research variables

variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Attitude	0.792	-	-	-	-	-	-	-	-
Effort Expectancy	0.229	0.760	-	-	-	-	-	-	-
Facilitating conditions	0.240	0.710	0.721	-	-	-	-	-	-
Habit	0.236	0.580	0.780	0.768	-	-	-	-	-
Hedonic Motivation	0.113	0.193	0.304	0.403	0.735	-	-	-	-
Performance Expected	0.215	0.791	0.597	0.646	0.201	0.824	-	-	-
Value for money	0.167	0.676	0.802	0.837	0.422	0.586	0.763	-	-
Social influence	0.287	0.710	0.708	0.672	0.269	0.406	0.662	0.818	-
Willingness to use	0.280	0.723	0.726	0.754	0.330	0.687	0.745	0.794	0.822

Based on the findings of this research, all the research variables exhibit favorable conditions. The fundamental metric for evaluating endogenous variables is the coefficient of determination. Values of 0.25, 0.5, and 0.75 signify small, medium, and large differences in one structure compared to another structure, respectively. The coefficient of determination values for attitude to use and willingness to use variables are 0.096 and 0.496, indicating a suitable fit for the structural model. Furthermore, the quality index of the structural model remarkably assesses its predictive capabilities. Q2 values greater than zero indicate the predictive ability of the model. The obtained Q2 values for attitude to use variables are 0.194 and for the tendency to use variables, 0.338, demonstrating the structural model's appropriate predictive quality.

Table 4. Evaluation indices of the structural model

Variable	Q2	R Square
Attitude	0.064	0.096
Willingness to use	0.364	0.496

Table 5 shows the results of the path coefficient analysis and the significance level of this research.

Table 5. Evaluation indices of the structural model

Path	Original Sample	SD	T value	p
Attitude → willingness to use	0.527	0.039	13.351	0.029
Effort Expectancy → Attitude	0.146	0.076	3.070	0.050
Facilitating conditions → Attitude	0.453	0.077	4.692	0.005
Facilitating conditions → Willingness to use	0.308	0.042	7.402	0.000
Habit → Attitude	0.121	0.083	2.455	0.046
Habit → willingness to use	0.413	0.046	9.024	0.000
Hedonic Motivation → Attitude	0.120	0.050	1.397	0.027
Hedonic Motivation → Willingness to use	0.054	0.039	1.378	0.000
Performance Expected → Attitude	0.314	0.077	3.176	0.001
Value for money → Attitude	-0.120	0.081	1.484	0.139
Social influence → Attitude	0.149	0.068	2.184	0.029

According to the results presented in Table 5, it can be concluded that only the price value variables related to attitude to use do not exhibit a significant level of significance (P=0.139). However, the results indicate that the remaining variables in this model demonstrate an acceptable level of significance. Next, Figure 2 shows the structural equation model of this research.

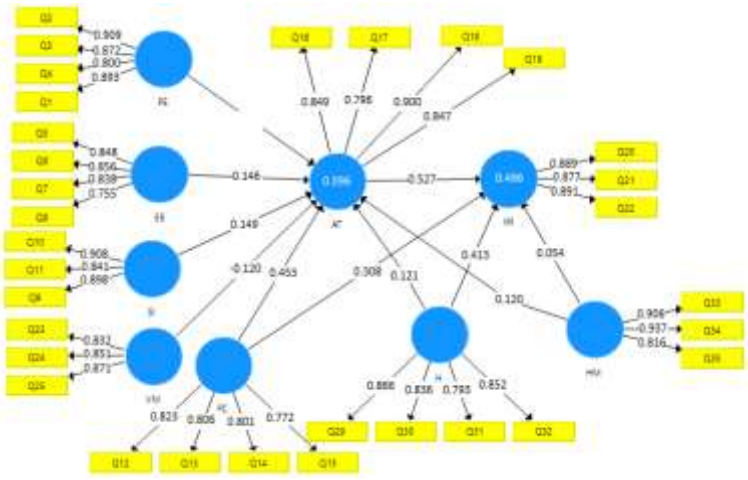

Figure 2. Structural equation model

Discussion

In today's education landscape, we are witnessing the growth and proliferation of advanced technologies. Among these technologies, extended reality stands out as a revolutionary innovation. This technology has significantly reshaped educational approaches for both students and professionals, resulting in a marked enhancement of educational standards and the emergence of novel methodologies in the medical and health sectors. The findings of the current research indicate a positive and significant relationship between learners' attitudes toward extended reality technology and their willingness to use this technology in health science education. These findings, supported by previous studies, reinforce the notion that a positive attitude toward extended reality is closely associated with an increased desire to utilize this technology in education (Cavdar Aksoy et al., 2020; Chopdar & Balakrishnan, 2020; Nazemi Bidgoli et al., 2023). Based on the results obtained, it is recommended to integrate educational programs and special workshops into the health sciences curriculum to enhance understanding and promote a positive attitude towards extended reality technology. Furthermore, developing and implementing engaging, interactive educational content that leverages extended reality capabilities can greatly enhance students' enthusiasm and interest in incorporating these technologies into their learning journey.

In the present study, the investigations revealed a positive and significant relationship between users' expectation of effort and their attitude toward new technologies. Simply put, how much effort users perceive is needed to utilize the new technology directly impacts their attitude toward it (Venkatesh et al., 2003). The results derived from the data analysis of this study align with previous findings, all underlining the significance of perceived ease of use of new technologies and their influence on technology acceptance (Amare et al., 2024; Koh et al., 2024). This underscores ease of use as a crucial factor in fostering users' positive attitudes towards new technologies. Therefore, it is recommended to prioritize the principle of ease of use in designing educational programs and developing new technologies to reinforce users' positive attitudes towards adopting these technologies. The development of new technologies and instructional materials has to be initiated with medical students’ learning objectives and skills that the learners are expected to develop in mind in order to reduce the usability induced mental load. Lecturers and technology specialists should be in a position to ensure this.

Based on the research findings, it is evident that the existence of facilitating conditions correlates positively and significantly with the attitude and willingness to use extended reality technology. Therefore, the easier it is for learners to interact with these systems and perceive them as user-friendly, the higher the likelihood of technology acceptance and continuous use (Muhaimin et al., 2019). These findings align with previous research and demonstrate that facilitating conditions play a crucial role in predicting the adoption of new technologies (Muhaimin et al., 2019; Yee & Abdullah, 2021). Based on the results, the key focus lies in ensuring facilitating conditions for novice users. These conditions encompass access to essential resources, hands-on training, and reliable technical assistance, all contributing to improving users' comfort with new technologies. Additionally, it is crucial to foster a positive mindset in learners by highlighting the advantages of technology use and addressing potential technical or psychological obstacles. Ultimately, it is advised that technology creators prioritize understanding users' preferences and needs to offer solutions that simplify and enhance the user experience.

The results of this research revealed a significant and positive relationship between habits, attitudes, and the acceptance of technology use. Habit has been explored from two perspectives. The first perspective sees habit as a repetitive action (Kim & Malhotra, 2005), while the second view defines it as an automatic behavior. While these perspectives provide a theoretical foundation, their practical implications in the context of extended reality (XR) technology in education warrant closer examination.The repetitive use of XR tools in education enhances familiarity and habit formation by providing immersive and interactive experiences that improve student engagement and information retention. This is supported by research indicating that XR technologies, such as virtual reality (VR) and augmented reality (AR), can significantly enhance learning by making educational content more engaging and intuitive for students (Alnagrat et al., 2022). Additionally, XR tools offer opportunities for repeated simulated exposures in a safe environment, which helps build competency and confidence in learners, further contributing to habit formation (Lee & Takenaka, 2022). Venkatesh and colleagues identify habit in their model as learners' general inclination to automatically engage with technology or technology-related behaviors. This discussion is pertinent to various fields including psychology, consumer behavior, education, health, and management (Limayem et al., 2007). Based on these findings and their consistency with prior research (Dhiman et al., 2020; Venkatesh et al., 2012) it is suggested that

gamification-based educational programs be designed to facilitate and strengthen habit formation in the use of augmented and virtual reality (XR) technologies. These programs should encourage interaction and frequent use of these technologies by providing attractive goals and appropriate rewards. Additionally, offering interactive and practical simulations in safe learning environments can help increase users' skills and confidence while also promoting the consolidation of automatic behaviors in the use of these technologies.

The research findings revealed that the hedonic motivation of learners correlates positively and significantly with their attitude and willingness to use extended reality technology, consistent with previous studies (Faqih & Jaradat, 2021; Tamilmani et al., 2019). Hedonic motivation is rooted in the idea that if technology enhances pleasurable experiences and feelings, individuals are inclined to take action to attain positive and beneficial experiences. Drawing from extended reality research, incorporating elements like excitement, interaction, and motivation can enhance user experience, thereby influencing attitudes and willingness to embrace and utilize this technology (Kim & Hall, 2019). Accordingly, crafting extended reality applications that offer captivating and interactive educational experiences can effectively boost learner adoption of this technology. This can be achieved through integrating extended reality-based educational games and interactive group activities leveraging extended reality technology. The aim is to bolster learners' intrinsic motivation and eagerness to accept and utilize extended reality technology by establishing stimulating and engaging learning settings.

Consistent with earlier findings, the study affirms the beneficial effects of social influence and expected performance on attitudes toward adopting extended reality (XR) technology (Fathima & Muthumani, 2015; Kim et al., 2024; Muhaimin et al., 2019; Venkatesh et al., 2012). Expected performance as the belief in the innovation's ability to achieve desired outcomes (Venkatesh et al., 2012). XR technology, with its immersive features, can significantly enhance learning and skill development, such as virtual surgeries for medical students. Emphasizing these benefits through demonstrations and success stories can improve attitudes toward XR adoption. Social influence involves the effect of opinions, behaviors, and norms within a social context on an individual's decision to adopt technology (Venkatesh et al., 2012). The significant and positive relationship identified in this study highlights the power of leveraging influential figures such as professors, researchers, or industry leaders. When these respected individuals advocate for XR technology,

their endorsements not only validate the technology but also inspire confidence among peers and learners, encouraging broader adoption.

The findings of this research reveal the significant and negative impact of price value on users' attitudes toward utilizing extended reality technology. As defined by Zitamel, price value refers to assessing the benefits gained in comparison to the costs involved in using reality (Zeithaml, 1988). This concept is particularly pertinent in educational platforms.This concept is crucial in understanding technology adoption, as users often weigh the perceived benefits against the financial costs (Rahman et al., 2022). In the context of XR technology, high costs can deter users, leading to a negative attitude towards adoption, as the perceived value may not justify the expense(Agyemang et al., 2024). Reports have highlighted both the positive and negative impacts of this variable on the willingness to adopt extended reality technology (Tamilmani et al., 2019), demonstrating how factors like variations in statistical populations and economic status can influence perceptions and attitudes. The study highlights that individuals tend to form adverse attitudes when they perceive a mismatch between the financial investment required and the tangible benefits received.Furthermore, in the current economic climate, compounded by the effects of sanctions, the costs associated with adopting XR technology are likely to rise. This economic strain exacerbates users' concerns about affordability, making price value a decisive factor in shaping attitudes. To address this challenge, strategies such as offering subsidized pricing models, developing cost-effective solutions, or providing financial incentives could help mitigate the negative impact of price value on technology adoption.

The comprehensive findings of this study emphasize the transformative capacity of extended reality technology to revolutionize the education sector, especially within the health sciences field. This research establishes a distinct and favorable correlation between learners' attitudes toward XR and their willingness to embrace this technology, underscoring the crucial role of user comprehension in the effective integration of avant-garde educational resources. Factors such as perceived ease, facilitating conditions, habits, hedonic motivation, expected performance, social impact, and price value have a significant impact on learners' attitudes and willingness to adopt XR. The implications of these findings suggest that for effective integration of XR technology into educational programs, it is necessary to take a multifaceted approach to address these key factors.

To create an effective XR-based learning experience, it's vital to design engaging and interactive content that aligns with educational objectives. For instance, adding gamified elements like challenges, quizzes, and scenario-based simulations can boost user engagement and foster active learning. Moreover, it's important to ensure that the interface is intuitive and user-friendly, especially for beginners. Implementing clear onboarding processes, tutorials, and technical support can help users feel more confident and comfortable, making the technology more inclusive and accessible. By combining well-defined content strategies with user-centered design, XR can be effectively leveraged to deliver impactful educational experiences.

However, this research also highlights several limitations and areas for future research. One notable limitation is the potential impact of economic factors, such as the costs associated with adopting XR technology, which can significantly influence users' attitudes and willingness to adopt. This underscores the need for cost-effective solutions and funding mechanisms to reduce economic barriers to XR technology adoption. Furthermore, the findings of this study are based on a specific context and community, which may limit their generalizability to other settings and disciplines. Future research could examine the application and impact of XR technology in a wider range of educational contexts and explore the long-term effects on learning outcomes and student engagement. Additionally, investigating potential psychological and technical barriers to XR adoption can provide deeper insight into how to overcome these challenges and maximize the educational benefits of this promising technology.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the ethics committee of University of Tehran. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors contributed to the study conception and design, material preparation, data collection, and analysis. All authors contributed to the article and approved the submitted version.

Funding

The authors did (not) receive support from any organization for the submitted work.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

Abotaleb, B., & Heshmati, H. (2016). Factors associated with pesticide use behaviors among farmworkers based on health belief model. *Iranian journal of public health*, *45*(2), 276-277.

Agyemang, C. M., T, S., & Boison, D. (2024). To Assess Factors Affecting Pension Subscribers' Behavioral Intentions to Adopt Technology in The Pension Schemes. *International Journal of Religion*, *5*, 7817-7827. https://doi.org/10.61707/y70rj647

Ahmadi, H., Arji, G., Shahmoradi, L., Safdari, R., Nilashi, M., & Alizadeh, M. (2019). The application of internet of things in healthcare: a systematic literature review and classification. *Universal Access in the Information Society*, *18*, 837-869. https://doi.org/https://doi.org/10.1007/s10209-018-0618-4

ALAH, V. H., Delgoshaei, B., JARIANI, A., & Loghmanian, L. (2005). Assessment of the village health workers educational activities.

Alalwan, A. A., Baabdullah, A. M., Rana, N. P., Tamilmani, K., & Dwivedi, Y. K. (2018). Examining adoption of mobile internet in Saudi Arabia: Extending TAM with perceived enjoyment, innovativeness and trust. *Technology in Society*, *55*, 100-110. https://doi.org/https://doi.org/10.1016/j.techsoc.2018.06.007

Alnagrat, A., Ismail, R. C., Idrus, S. Z. S., & Alfaqi, R. M. A. (2022). A review of extended reality (XR) technologies in the future of human education: Current trend and future opportunity. *Journal of Human Centered Technology*, *1*(2), 81-96.

Amare, E. M., Zegeye, R. T., Wondie, S. G., Negash, T. T., & Siyoum, M. T. (2024). Getting ready for digital shift: the level of acceptance towards educational technology among faculty members in higher education institutions in Ethiopia. *Discover Education*, *3*(1), 10. https://doi.org/http://doi.org/10.1007/s44217-024-00090-1

Baabdullah, A., Dwivedi, Y., & Williams, M. (2014). Adopting an extended UTAUT2 to predict consumer adoption of M-technologies in Saudi Arabia.

Baradaranrezaei M, M. S., Piri H, Jabbarzadeh T. (2007). Quality of educational services provided to pregnant women in health centers. *Nursing & Midwifery Journal*, *2*(5), 14-20.

Carney, T. J., & Kong, A. Y. (2017). Leveraging health informatics to foster a smart systems response to health disparities and health equity challenges. *Journal of Biomedical Informatics*, *68*, 184-189. https://doi.org/https://doi.org/10.1016/j.jbi.2017.02.011

Cavdar Aksoy, N., Kocak Alan, A., Tumer Kabadayi, E., & Aksoy, A. (2020). Individuals' intention to use sports wearables: the moderating role of technophobia. *International Journal of Sports Marketing and Sponsorship*, *21*(2), 225-245. https://doi.org/https://doi.org/10.1108/IJSMS-08-2019-0083

Chang, C. C. (2013). Exploring the determinants of e-learning systems continuance intention in academic libraries. *Library Management*, *34*(1/2), 40-55. https://doi.org/https://doi.org/10.1108/01435121311298261

Chopdar, P. K., & Balakrishnan, J. (2020). Consumers response towards mobile commerce applications: SOR approach. *International Journal of Information Management*, *53*, 102106. https://doi.org/https://doi.org/10.1016/j.ijinfomgt.2020.102106

Cicchirillo, V. (2024). Consumer Gratifications for Gamified e-Services. *Services Marketing Quarterly*, *45*(1), 105-127. https://doi.org/https://doi.org/10.1080/15332969.2023.2299099

Dhillon, P. K. S., & Tinmaz, H. (2024). Immersive realities: a comprehensive guide from virtual reality to metaverse. *Journal for the Education of Gifted Young Scientists*, *12*(1), 29-45. https://doi.org/https://doi.org/10.17478/jegys.1406024

Dhiman, N., Arora, N., Dogra, N., & Gupta, A. (2020). Consumer adoption of smartphone fitness apps: an extended UTAUT2 perspective. *Journal of Indian Business Research*, *12*(3), 363-388. https://doi.org/https://doi.org/10.1108/JIBR-05-2018-0158

El Shemy, I., Jaccheri, L., Giannakos, M., & Vulchanova, M. (2024). Augmented reality-enhanced language learning for children with autism spectrum disorder: a systematic literature review. *Behaviour & Information Technology*, 1-28. https://doi.org/https://doi.org/10.1080/0144929X.2024.2304607

Faqih, K. M., & Jaradat, M.-I. R. M. (2021). Integrating TTF and UTAUT2 theories to investigate the adoption of augmented reality technology in education: Perspective from a developing country. *Technology in Society*, *67*, 101787. https://doi.org/https://doi.org/10.1016/j.techsoc.2021.101787

Fathima, Y. A., & Muthumani, S. (2015). User acceptance of banking technology with special reference to internet banking. *Journal of Theoretical & Applied Information Technology*, *73*(1).

Galvani, A. P., Parpia, A. S., Foster, E. M., Singer, B. H., & Fitzpatrick, M. C. (2020). Improving the prognosis of health care in the USA. *The Lancet*, *395*(10223), 524-533. https://doi.org/https://doi.org/10.1016/S0140-6736(19)33019-3

Green, L. W., & Kreuter, M. W. (2005). Health program planning: An educational and ecological approach. *(No Title)*.

Heshmati, H., Behnampour, N., Haji-Ebrahimi, M. H., Charkazi, A., Asadi, Z., & Dehnadi, A. (2012). Elderly hygiene status in rural areas of Golestan Province in Iran. *Iranian Journal of Ageing*, *7*(1), 25-33. http://salmandj.uswr.ac.ir/article-1-483-en.html

Heshmati, H., Behnampour, N., Homaei, E., & Khajavi, S. (2014). Predictors of fruit and vegetable consumption among female high school students based on PRECEDE model. *Iranian journal of health education and health promotion*, *1*(4), 5-14. http://journal.ihepsa.ir/article-1-102-en.html

Heshmati, H., Shakibazadeh, E., Foroushani, A. R., & Sadeghi, R. (2020). A comprehensive model of health education barriers of health-care system in Iran. *Journal of Education and Health Promotion*, *9*. https://doi.org/http://doi.org/10.4103/jehp.jehp_23_20

Iatsyshyn, A. V., Kovach, V. O., Romanenko, Y. O., Deinega, I. I., Iatsyshyn, A. V., Popov, O. O., Kutsan, Y. G., Artemchuk, V. O., Burov, O. Y., & Lytvynova, S. H. (2020). Application of augmented reality technologies for preparation of specialists of new technological era.

Jagatheesaperumal, S. K., Ahmad, K., Al-Fuqaha, A., & Qadir, J. (2024). Advancing education through extended reality and internet of everything enabled metaverses: applications, challenges, and open issues. *IEEE Transactions on Learning Technologies*. https://doi.org/10.1109/TLT.2024.3358859

Kianian, T., Zare, M., Ildarabadi, E., KARIMI, M. H., & Saber, S. (2014). Evaluation of training competency of health care workers in training clients and patients.

Kim, D., Chae, H., Kim, Y., Choi, J., Kim, K.-H., & Jo, D. (2024). Real-Time Motion Adaptation with Spatial Perception for an Augmented Reality Character. *Applied Sciences*, *14*(2), 650. https://doi.org/https://doi.org/10.3390/app14020650

Kim, M. J., & Hall, C. M. (2019). A hedonic motivation model in virtual reality tourism: Comparing visitors and non-visitors. *International Journal of Information Management*, *46*, 236-249. https://doi.org/https://doi.org/10.1016/j.ijinfomgt.2018.11.016

Kim, S. S., & Malhotra, N. K. (2005). A longitudinal model of continued IS use: An integrative view of four mechanisms underlying postadoption phenomena. *Management science*, *51*(5), 741-755. https://doi.org/https://doi.org/10.1287/mnsc.1040.0326

Koh, C.-M., Chong, T.-P., Hasan, N. B. A., Foo, C.-C., Ng, C.-P., & Tan, T.-H. (2024). Exploring the technology acceptance of digital banking services in Malaysia with UTAUT model. *Journal of Banking and Financial Technology*, 1-9.

Lee, Y.-C. J., & Takenaka, B. P. (2022). Extended reality as a means to enhance public health education. *Frontiers in Public Health*, *10*, 1040018.

Limayem, M., Hirt, S. G., & Cheung, C. M. (2007). How habit limits the predictive power of intention: The case of information systems continuance. *MIS quarterly*, 705-737. https://doi.org/https://doi.org/10.2307/25148817

Lu, Y., Zhou, T., & Wang, B. (2009). Exploring Chinese users' acceptance of instant messaging using the theory of planned behavior, the technology acceptance model, and the flow theory. *Computers in human behavior*, *25*(1), 29-39. https://doi.org/https://doi.org/10.1016/j.chb.2008.06.002

Manis, K. T., & Choi, D. (2019). The virtual reality hardware acceptance model (VR-HAM): Extending and individuating the technology acceptance model (TAM) for virtual reality hardware. *Journal of Business Research*, *100*, 503-513. https://doi.org/https://doi.org/10.1016/j.jbusres.2018.10.021

Mohajeri, S., & Seyed, M. (2010). Simulation and virtual reality؛ A new method to improve the quality of medical education. *Horizon Med Edu Develop*, *4*(1), 1-6.

Mouakket, S. (2015). Factors influencing continuance intention to use social network sites: The Facebook case. *Computers in human behavior*, *53*, 102-110. https://doi.org/https://doi.org/10.1016/j.chb.2015.06.045

Muhaimin, H., Mukminin, A., Pratama, R., & Asrial, H. (2019). Predicting factors affecting intention to use Web 2.0 in learning: evidence from science education. *Journal of Baltic Science Education*, *18*(4), 595.

Nazemi Bidgoli, A., Mohamadi Turkmani, E., & Irani, H. R. (2023). The Role of Perceived Risk in The Adoption of Internet of Things Technology in Sports. *Journal of New Studies in Sport Management*.

Rahman, M. S., Das, S., Hossain, G. M. S., & Tajrin, T. (2022). Teenagers' behavioural intention towards wearable technologies and intention to recommend others: An empirical study in Bangladesh. *Journal of Science and Technology Policy Management*, *13*(1), 110-131.

Rajabiyan Dehzireh, M., Maghami, H., Esmaeeli Gujar, S., & Sharifati, S. (2017). The effect of educational augmented reality on lifelong learning and learning performance in students. *Technology of Instruction and Learning*, *3*(9), 63-91. https://doi.org/https://doi.org/10.22054/jti.2020.43564.1268

Rudnicka, Z., Proniewska, K., Perkins, M., & Pregowska, A. (2024). Cardiac Healthcare Digital Twins Supported by Artificial Intelligence-Based Algorithms and Extended Reality—A Systematic Review. *Electronics*, *13*(5), 866. https://doi.org/https://doi.org/10.3390/electronics13050866

Salcedo, D., Regan, J., Aebersold, M., Lee, D., Darr, A., Davis, K., & Berrocal, Y. (2022). Frequently used conceptual frameworks and design principles for extended reality in health professions education. *Medical Science Educator*, *32*(6), 1587-1595.

Scavarelli, A., Arya, A., & Teather, R. J. (2021). Virtual reality and augmented reality in social learning spaces: a literature review. *Virtual Reality*, *25*, 257-277.

Tamilmani, K., Rana, N. P., Prakasam, N., & Dwivedi, Y. K. (2019). The battle of Brain vs. Heart: A literature review and meta-analysis of "hedonic motivation" use in UTAUT2. *International Journal of Information Management*, *46*, 222-235. https://doi.org/https://doi.org/10.1016/j.ijinfomgt.2019.01.008

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478. https://doi.org/https://doi.org/10.2307/30036540

Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS quarterly*, 157-178. https://doi.org/https://doi.org/10.2307/41410412

Waisberg, E., Ong, J., Masalkhi, M., Zaman, N., Sarker, P., Lee, A. G., & Tavakkoli, A. (2024). Apple Vision Pro and why extended reality will revolutionize the future of medicine. *Irish Journal of Medical Science (1971-)*, *193*(1), 531-532.

Yang, D., Zhou, J., Chen, R., Song, Y., Song, Z., Zhang, X., Wang, Q., Wang, K., Zhou, C., & Sun, J. (2022). Expert consensus on the metaverse in medicine. *Clinical eHealth*, *5*, 1-9. https://doi.org/https://doi.org/10.1016/j.ceh.2022.02.001

Yee, M. L. S., & Abdullah, M. S. (2021). A review of UTAUT and extended model as a conceptual framework in education research. *Jurnal Pendidikan Sains Dan Matematik Malaysia*, *11*, 1-20. https://doi.org/https://doi.org/10.37134/jpsmm.vol11.sp.1.2021

Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence. *Journal of marketing*, *52*(3), 2-22. https://doi.org/https://doi.org/10.1177/002224298805200302