Library Progress International *Print version ISSN 0970 1052*
Vol.44 No.3, Jul-Dec 2024: P.5047-5056 *Online version ISSN 2320 317X*

Original Article *Available online at www.bpasjournals.com*

An Empirical Study on Factors Driving the Adoption of Augmented and Virtual Reality Technology in Higher Education

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How to cite this article: Varunan, Pradeep Malik (2024). An Empirical Study on Factors Driving the Adoption of Augmented and Virtual Reality Technology in Higher Education *Library Progress International,* 44(3), 5047-5056.

ABSTRACT
Immersive augmented and virtual reality technologies are sophisticated digital technologies that have a profound impact on various environments and industries. The shift from conventional to digital or mixed learning techniques and technologies is a very notable advancement in higher education. The adoption and utilization of these immersive tools poses several challenges for all pertinent businesses. The study aimed to investigate the adoption of both augmented and virtual reality technologies by learners, as well as the factors influencing their application in higher education. In order to achieve this purpose, the study utilised the theoretical framework of the technology acceptance model. An empirical study was conducted on students from higher educational institutions in bengaluru, karnataka. Data were collected by an online survey from the sample group, which consisted of 240 students. For data analysis, spss 23 was employed. The findings from the multiple regression and anova demonstrate that perceived ease of use, self-efficacy, complexity, and usefulness are important factors that can accurately predict the adoption of technology and the acceptance of immersive technologies by users. These findings provide evidence for the advancement of tam theory and the effective implementation of interactive technology in higher education. The research findings will assist leaders and administrators of higher education institutions in focusing on the establishment of infrastructure, training of teachers, and the development of innovative teaching methods to integrate immersive augmented and virtual reality technology into curriculum.

Keywords: Augmented Reality, Virtual Reality, Technology Adoption, Tam, Higher Education

INTRODUCTION

Despite being subjects of research for many years, the recent availability of advanced technology to a broader client base has reignited significant research efforts in the disciplines of augmented and virtual reality (VR/AR). The sole differentiation between augmented reality AR and virtual reality VR as technology tools is in the degree of user involvement. Virtual reality (VR) offers consumers a fully immersive experience in different environments, while augmented reality (AR) enables users to interact with their present surroundings. (Yung & Khoo-Lattimore, 2019). As stated by Akçayr & Akçayr (2017), AR technology is used to display virtual goods in the real environment. After then, it seems as though those virtual items are positioned next to actual objects. Virtual reality (VR) is a technology that enables people to explore computer-generated surroundings and fully engage in a digital interactive representation of places or situations (Hunter, 2016). This enhances their capacity to effectively accomplish activities and meet obligations for various purposes (Khoo-Lattimore, 2019). Academic studies suggest that AR and VR are efficient instructional techniques that align well with the present emphasis on digital and mixed learning (Boulton et al., 2018). Various research has shown the advantages of VR and AR in enhancing academic performance (Chen, 2016). In their study, Merchant (2014) showcased the advantages of using augmented reality (AR) in educational environment, such as enhanced learning outcomes, increased motivation, and more student engagement. Various research on virtual VR and AR have demonstrated improvements in students' academic performance, motivation, teamwork, and cognitive and physical skills (Harris, Kristan, & Denise Reid, 2005). Technological innovations such as VR and AR enhance decision-making by immersing users in virtual environments. This enables them to explore, understand complex concepts, create new experiences, and engage in experiential learning. As a result, students are encouraged to actively participate and become more engaged in the learning process. In their study, Jorge Martn-Gutiérrez, et al. (2017) provide a comprehensive analysis of the four main advantages of using immersive technologies in education can enhance learner engagement and motivation. By analysing three-dimensional visuals, students participate in immersive interactions that enhance their learning. VR and AR facilitate an innovative approach to education. Learners have the opportunity to actively participate, interacting with both their peers and virtual components. Consequently, learners have the ability to examine, analyse, and receive information, so creating a chance for learning.

The costs associated with VR and AR are decreasing, hence increasing their accessibility to a larger audience. Recent technological breakthroughs have made it simpler for smartphones, computers, and game consoles to access VR/AR technologies. Learners may now conveniently retrieve shared Virtual resources without the requirement of intricate technology using well-known internet platforms like as YouTube. In addition, learners with special needs can interact with virtual items and other students, and they also have easier access to virtual settings (Kandalaft et al., 2013). VR and AR foster more engagement in comparison to conventional learning methods. VR/AR technology allows students to actively participate in learning by using haptic gloves, headgear, and motion detectors, which enhances their sense of immersion and engagement with different educational topics. By participating in this distinctive involvement, students have the opportunity to engage with authentic situations that would otherwise be inaccessible to them (Mercè Bernaus et.al., 2009). Recently, there has been extensive study focused on comprehending student attitudes and motivations towards immersive technology. The objective of this study is to analyse the perspectives of students in relation to adoption of augmented reality/virtual reality technology in educational settings. Certain academics argue that the viewpoint of students is crucial to the process of teaching and acquiring knowledge.

LITERATURE REVIEW

VR/AR Technology in Higher Education

Across all educational domains, there has been a general increase in the adoption of AR and VR technologies by institutions to enhance learning experience. Schools and colleges are implementing technology advancements into their courses by constructing infrastructure and allocating cash. To achieve the intended learning outcomes, it is essential to precisely align AR/VR technology with the curriculum. Various ideas, such as innovation diffusion theory, have been employed to explain the acceptance of technology developments in education. (Straub, 2009). Key factors influencing the adoption of virtual labs include the acceptance of technology, the perceived benefits, the willingness to utilize them, and the preparedness to embrace technology (Achuthan et al., 2020). Technology trialability allows users to directly experience and investigate technology, which is why it is positively associated with the pace at which innovation is adopted (Rogers, 1995). Consequently, for an educator to be willing to integrate VR and AR into their teaching, they must possess the ability to utilize these technologies themselves.

The extensive range of techniques applicable to VR and AR technologies makes this observation particularly noteworthy (Grivokostopoulos et al., 2020). According to Reeves and Crippen (2020), the use of technology such as VR and AR does not by itself ensure successful learning outcomes. Several factors, such as infrastructure, student adaptability to technology advancements, and teacher knowledge, contribute to achieving positive educational results. There is a paucity of data about the long-term adoption of technology in higher education institutions, as well as insufficient information on the best designs and prices for virtual reality (VR) and augmented reality (AR) teaching aids. Insufficient information is a challenge for educational institutions when it comes to making decisions about VR and AR technologies, justifying substantial expenditures in centralized learning. AR and VR enhance student engagement and provide a deeper comprehension, resulting in enhanced learning efficiency. Through the utilization of VR technology, educators have the ability to create an interactive and captivating learning experience, where they may introduce complex ideas to pupils inside a supervised setting. Liu and Xiao (2008) established a framework to examine the connection between learner perception and AR and VR technologies. In consideration of reasoned action theory (Fishbein & Ajzen, 1975), they devised this technique. They used techniques including hypothesis testing, factor analysis, connection analysis, and experimental assessment of them utilizing David's 1988 TAM and innovation diffusion model. The study revealed a positive association among all the characteristics believed to be associated with student perception.

Adoption of AR/VR technology

According to Yung and Khoo-Lattimore (2019), AR/VR have the capacity to offer more advantageous, captivating, and engaging learning experiences while acknowledging the associated problems and difficulties. Soltani and Morice (2020) examined the advantages and challenges associated with augmented reality (AR) in sports teaching and training. It was proposed that several augmented reality (AR) methods may be employed to enhance the learning process and effectiveness by delivering feedback through visual, aural, and haptic information. Additionally, these methods could be utilized in the design of training situations. In the realm of education, AR/VR are believed to offer several advantages. These include enhancing student enjoyment and motivation (Huang et.al., 2013), reducing cognitive overload and fostering skill development (Bower et.al., 2014), and enabling teaching that promote collaboration (Pratt & Hahn, 2016).

Theoretical basis for Developing Research Hypothesis and Model

The TAM model is derived from the TRA model. It is that, a person's attitude and behaviour are determined by their reaction and perception of something. The reactions and views of people towards Information Technology (IT) will influence their adoption of the technology. User perception is a significant aspect that may impact the utility and ease of use of information technology. It is based on the user's context and can determine how someone perceives the advantages and convenience of using IT. This perception can also serve as a standard for how people adopt and embrace new technologies. The TAM model, derived from psychological theory, elucidates the user behaviour of a computer system by focusing on trust, attitude, intention, and user relationship behaviour (Saadé et al., 2007). The objective is to elucidate the primary determinants of user behaviour in relation to the acceptance of technology by users. Individuals exhibit varying patterns of technology adoption, and researchers have put forth several theories and models to investigate the factors influencing their acceptance and usage (Ukpabi & Karjaluoto, 2017). A few of these theories, Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2012), have their roots primarily in the information systems discipline. The TAM theory posits that consumers' attitudes towards and intention to use a technology may be predicted by two key influencing factors: perceived ease-of-use and usefulness (Venkatesh & Davis, 2000). We chose to employ Technology Acceptance Model since it has been widely supported by empirical evidence (Ukpabi & Karjaluoto, 2017). Research was carried out in many settings and circumstances, including university education, online learning, and secondary education (Wojciechowski & Cellary, 2013), indicating that the Technology Acceptance Model is a robust theoretical framework. Yung and Khoo-Lattimore (2019) state that the TAM model is the predominant theory utilized in studies on higher education.

Factors that influence the adoption of AR/VR technology among learners

Researchers have pointed out that TAM is overly broad and lacks the capability to offer insights into users' perspectives within a particular environment (Ukpabi & Karjaluoto, 2017). Therefore, researchers should include supplementary parameters to enhance its predictive effectiveness (Mehta et.al. 2019). In education sector researchers have expanded Technology Acceptance Model by incorporating additional factors to enhance its ability to explain and predict outcomes (Yung & Khoo-Lattimore, 2019). There are various methods to influence an individual's belief that a particular technology is user-friendly (O'Keefe, 2016). Each of these tactics, whether used separately or together, has a beneficial impact on an individual's opinion that using a specific technology would be effortless. The hypothesis developed is,

H1: Perceived ease of use positively relates to AR/VR technology adoption

According to Elbeltagi (2017), complexity is "the extent for which an innovation is thought to be relatively challenging to understand and apply." The likelihood of a hotel opting to adopt intricate technologies is really minimal. Indicates that the adoption of Technology is strongly correlated with the perceived complexity. Based on past experience with technology, the adoption of IT and any new technology that follows will be negatively affected by complexity (Murillo, 2014). Only a small number of organizations will be willing to invest time in educating personnel to achieve a high level of expertise, as they consider it to be a waste of time. Businesses prioritize receiving applications from individuals who possess the necessary skills, rather than investing resources in training new employees (Qirim, 2019). Research indicates that organizations are more reluctant to adopt a new technology if they anticipate that their staff will need to acquire a significant amount of new expertise (Sahadev & Islam, 2018). Regardless of the potential advantages, employees will refrain from using technology if they perceive it as challenging (Mndzebele, 2023). It can be inferred that the acceptance of technology is strongly correlated with how complex it is regarded to be. There is a high likelihood of technology adoption if it is user-friendly.

H2: ***Complexity positively relates to AR/VR technology adoption***

When it comes to ensuring that a service, system, or product is easy to use and facilitates pleasant user interactions with the least amount of cognitive strain and effort, these qualities are invaluable in design. It aims to go beyond just functionality, striving to create user experiences that are straightforward, effortless, and enjoyable. In today's economy, technology is increasingly becoming an integral part of people's lives, permeating various aspects such as the development of software, the design of products, interface design, and the physical environment. This widespread integration has led to a growing acceptance of user-friendly experiences across several domains. Learning outcomes from VR training may be more positively viewed by students when they believe that the training facilitates the acquisition of particular skills or knowledge (perceived VR usefulness) and that process of learning is simple (i.e., perceived ease of use). As per Theory of Reasoned Action by Ajzen and Fishbein (1980), the attitude towards a planned behaviour is determined by the intensity of behavioural belief and the assessment of prospective outcomes. Accordingly, students who find VR and AR technology to be highly effective or easy to use typically approach their studies with a positive outlook (Luo et al., 2021). The presence of a positive attitude will thereafter inspire learners to actively participate in VR-based learning. Consequently, it is anticipated that learners who view VR training as valuable to their learning and effortless will exhibit higher levels of engagement in the learning process (Matsas et.al.2018). Therefore, we suggest the following hypotheses:

H3: ***Usefulness positively relates to AR/VR technology adoption***

Various fields possess distinct sorts of self-efficacy that align with their respective disciplines. For instance, the technical discipline encompasses technological self-efficacy (Wang et al., 2013). Technological self-efficacy refers to a learner's assessment of their own ability to effectively operate computer to complete a task. This covers their confidence in using online learning platforms as well as their overall computer skills (Wang et.al. 2013). Technological self-efficacy is the evaluation made by a student regarding their own competence in efficiently utilising a computer to successfully accomplish a task. An empirical investigation revealed a notable albeit modest association between technical self-efficacy and self-paced learning among individuals who had completed high school. A separate longitudinal study conducted by Holt and Brocket in 2022 demonstrated that technological self-efficacy has an impact on self-directed learning. According to research, learners are more likely to demonstrate a greater level of technological self-efficacy if they have a certain level of openness to accepting a technology. According to An et.al. (2021), learners will demonstrate a greater level of technical self-efficacy if they see a certain technology as being user-friendly. Furthermore, the research demonstrated that technology acceptability and technological self-efficacy exhibit reciprocal influence. Consequently, future research endeavours may seek to examine the correlation among autonomous learning and technological self-efficacy (Buonomo, 2019).

H4: ***Self-efficacy positively relates to AR/VR technology adoption***

RESEARCH OBJECTIVES AND FRAMEWORK

A framework was established through an examination of current literature to enhance comprehension of both the dependent and independent variables and their interrelationships. The exploratory inquiry will utilise the graphic below, which was constructed after an extensive review of the literature. The perceived ease of use, usefulness, complexity, self-efficacy is a dependent factor of the model, while the variables connected to adoption AR and VR technology are the independent variables. The hypothesis posits that these factors have a positive relationship to the adoption of AR/VR immersive technology in higher education. Figure 1 illustrates the theoretical basis of the analysis.

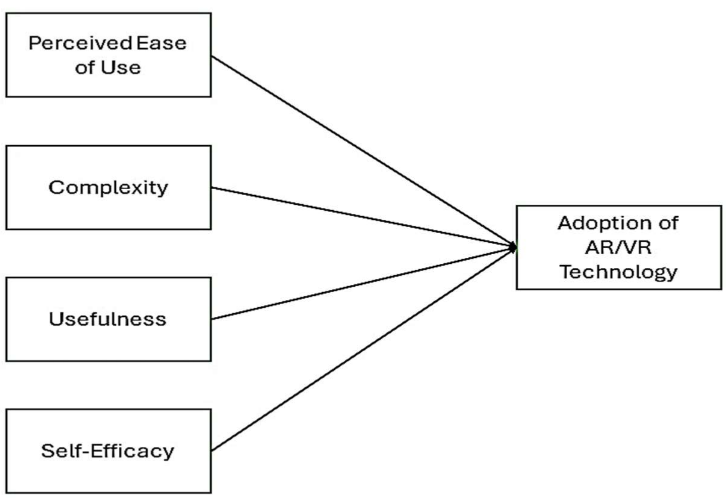

Figure 1: Framework for the study

The primary objectives are to

1. Determine students' perception on the adoption of AR/VR technology.
2. Analyse the relation between variables associated with AR/VR technologies adoption in higher education.
3. Examine the demographic attributes of the participants

RESEARCH METHODOLOGY

A carefully constructed and efficiently structured online questionnaire was utilized to collect firsthand information. This study utilized a sample collected from college students in Bengaluru, Karnataka, who were studying in various disciplines such as arts, sciences, architecture, engineering, and design. The sample was obtained through a convenient sampling method that was diverse, including respondents from various geographical areas, educational backgrounds, age categories, and courses of study. To enhance external validity of study, this action was undertaken. A digital questionnaire was distributed to collect data. The participants were also notified about the confidentiality of their responses and the protection of their identities. A total of 270 surveys were collected. Finally, a total of 240 data were included after conducting a screening to identify missing or incomplete information.

MEASURES

The questionnaire was constructed utilizing the Likert Scale, and further analysis was conducted. Age, gender, course, and graduation were all considered in a distinct area. The research included six independent variables and included 30 assertions regarding the views of the respondents on perceived ease of use, complexity, usefulness, and self-efficacy. The predicted dependent component is the adoption of technology. The TAM and previous studies, such as those conducted by Venkatesh et al. (2012), Huang (2015), and Mehta (2019), were utilized to create a measurement scale and items. These were subsequently adapted to suit the specific conditions of this research (Chiao et al., 2018).
Tests of reliability and validity were performed on each measurement. The grading scale for influence is as follows: strongly agree is rated 5, agree is rated 4, neutral is rated 3, strongly agree is rated 2, and strongly disagree is 1. The research findings indicate that the reliability coefficient, also known as Cronbach's alpha, was 0.912, reflecting the level of reliability of all factors.

DATA ANALYSIS AND RESULTS

The data is processed utilizing the SPSS 23 program. The study employed frequency and percentage analysis to investigate the socioeconomic attributes of the participants. The identification of the factors influencing students' perception of AR and VR technology in higher education institutions was achievable through the utilization of factor analysis and multiple regression. Socio-demographic study use descriptive statistics. The data reveals that men in the sample accounted for 58.3%, while the female in the sample accounted for 41.7%. Furthermore, 53% of the individuals belonged to the 18-21 age group, 36% belonged to the 21-23 age group, and 11% were in the 24 and above age category. 71.3% of the participants were pursuing postgraduate (PG) studies, while 28.7% were pursuing undergraduate (UG) studies. Out of the respondents, 65.8% were pursuing engineering, 27.9% were in the field of architecture and design, and just 6.3% had a background in arts and science. 45.5% of the participants utilize augmented reality (AR) and virtual reality (VR) technology specifically for gaming, while 14.2% employ it for purchasing purposes, and 40.4% utilize it for educational purposes. Among the participants, 75% expressed a preference for a hybrid or blended style of learning, whereas 18.3% favoured online or MOOCs, and 6.7% indicated a preference for conventional learning.

Table 1: Descriptive Statistics on Respondents

		n= 240	%
Gender	Male	140	58.3
	Female	100	41.7
Age	18-21	127	53
	21-23	86	36
	24 and above	27	11
Graduation	UG	69	28.7
	PG	171	71.3
Specialization	Architecture & Design	67	27.9
	Engineering	158	65.8
	Arts & Sciences	15	6.3
Purpose for using AR/VR technology	Gaming	109	45.4
	Shopping	34	14.2
	Education	97	40.4
Preferred mode of learning	Hybrid or blended	180	75
	Online, MOOCs	44	18.3
	Traditional classroom	16	6.7

Factor Analysis

After doing multiple regression and factor analysis, a number of components were eliminated from the study because they were not statistically significant. The selection approach was evaluated using KMO measure and Bartlett's test, as presented in Table 2.

The sample's appropriateness, as shown by the KMO measure, must be greater than 0.5. Nevertheless, the study findings suggest that in this specific instance, the value is 0.893. Therefore, this knowledge is really crucial.

Table 2. KMO and Barlett's Test

KMO and Barlett's Test		
KMO Measure of Sampling Adequacy		0.893
Bartlett's Test	Apx. Chi-Square	2387.382
	df	253
	Sig.	0.000

The extraction process demonstrates the overall diversity of the components, as seen in table 3. The minimum load required to integrate each component was determined by Hair (1992). Additionally, it is recommended that factors with a coefficient of determination (load) of 0.30 or higher be regarded as relevant, those with a load of 0.40 or higher be considered more significant, and those with a load of 0.50 or higher be declared extremely significant. No details have been missed in this case. Component 1's variance is matched by an eigenvalue of 7.986, or 34.72% of the variance overall. At 2.057, the eigenvalue for Component 2's variance corresponds to 8.941% of the variance overall. 6.759% of the overall variance is represented by the eigenvalue 1.554, which corresponds to Component 3's variance. 6.027% of the variance is represented by the eigenvalue of Factor 4's variance, which is 1.386. Component 5's eigenvalue, 1.092, represents 4.748% of the variance. Component 6's variance is 4.39% and its eigenvalue is 1.010. Often, the item's inherent affinity for a group is the decisive factor. The magnitude of the filling component grows as an item's association to a certain element becomes greater. The research findings indicate that each of the six variables - perceived utility, ease of use, complexity, and self-efficacy - exhibited consistent loadings on distinct aspects. Consequently, all 23 characteristics that were included in the four separate components are associated with the adoption of technology. The factor loading orders of magnitude for each figure in the table have been multiplied by 100. The rotated component matrix in Table 4 displays only loadings above 0.60.

Table 3. Total Variance Explained

Total Variance Explained									
Component	Initial Eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.986	34.724	34.724	7.986	34.724	34.724	3.254	14.146	14.146
2	2.057	8.941	43.665	2.057	8.941	43.665	3.037	13.205	27.351
3	1.554	6.759	50.424	1.554	6.759	50.424	2.483	10.796	38.147
4	1.386	6.027	56.451	1.386	6.027	56.451	2.150	9.347	47.493
5	1.092	4.748	61.199	1.092	4.748	61.199	2.089	9.084	56.577
6	1.010	4.390	65.589	1.010	4.390	65.589	2.073	9.012	65.589
7	0.793	3.448	69.037						
8	0.754	3.277	72.313						
9	0.618	2.688	75.001						
10	0.583	2.533	77.534						
11	0.572	2.486	80.020						
12	0.546	2.374	82.393						
13	0.511	2.223	84.617						
14	0.499	2.168	86.784						
15	0.429	1.866	88.651						
16	0.408	1.776	90.427						
17	0.384	1.668	92.095						
18	0.374	1.625	93.720						
19	0.353	1.533	95.252						
20	0.324	1.409	96.661						
21	0.286	1.243	97.904						
22	0.256	1.113	99.016						
23	0.226	0.984	100.000						

Table 4: Factor Analysis

Rotated Component Matrix							
S.No.	Factors	1	2	3	4	5	6
1	Learning operates easy	0.144	**0.732**	-0.020	-0.028	0.246	-0.034
2	Easy to get system	0.077	**0.795**	0.166	0.230	-0.093	0.150

3	Interaction clear	0.138	**0.730**	0.192	0.184	-0.047	0.058
4	Flexible to interact	0.115	**0.702**	0.136	0.027	0.293	0.265
5	East to become skilful	0.260	0.472	**0.581**	0.010	0.041	0.154
6	Easy to use	0.127	0.428	**0.509**	-0.142	0.347	0.009
7	Too much time from normal duties	0.185	0.360	**0.505**	0.283	-0.214	0.287
8	Complicated and difficult to understand	0.152	0.094	**0.568**	0.176	-0.003	0.487
9	Does not involve too much time	0.124	0.082	**0.764**	0.152	0.038	0.027
10	Too long to learn the working of system	0.026	0.200	0.423	-0.011	0.389	**0.551**
11	Interaction clear & understandable	0.191	-0.040	0.462	**0.515**	0.355	0.047
12	Easy to get system	0.148	0.126	0.066	0.265	**0.780**	0.079
13	Believe easy to use	0.212	0.054	0.319	**0.673**	0.238	0.106
14	Learning is easy	0.195	0.226	-0.050	**0.767**	0.127	0.136
15	Built-in help facility	0.267	0.084	0.018	0.072	**0.704**	0.204
16	Personnel assistance	0.089	0.135	0.027	0.214	0.420	**0.666**
17	Easier for user	0.469	0.091	0.122	0.425	-0.102	**0.480**
18	Without any assistance	0.486	0.121	0.106	0.078	0.096	**0.649**
19	Difficult for users	**0.667**	0.098	0.136	0.260	0.213	0.233
20	Competitive edge	**0.832**	0.082	0.065	0.019	0.137	0.104
21	Lead to privacy concerns	**0.741**	0.115	0.132	0.100	0.210	0.108
22	Adapt AR/VR	**0.680**	0.271	0.228	0.265	0.057	-0.057
23	Costly	**0.463**	0.172	0.148	0.379	-0.003	0.270

***Testing of Hypothesis*:**

The hypothesis of the research was evaluated using regression analysis after extracting four variables from the component analysis. The findings of the investigation about the viewpoint of the students are shown in Tables 5 and 6. The study's findings indicate that these four independent factors explain 49.4 percent of the variability in the adoption of AR and VR in higher educational institutions. The F value of 59.386 is statistically significant, with a p-value of 0.000. (Refer to Table 6 and 7). Hence, it is clear that these four elements are closely correlated with the acceptance and utilization of AR and VR technologies in higher education.

Table 5: Summary of Model

Model Summary				
Model	**R**	**R^2**	**Adjusted R^2**	**Std. Error of Estimate**
1	0.709	0.503	0.494	0.6047

IV: Perceived ease of use, Complexity, Usefulness Self-efficacy

Table 6: ANOVA

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	86.861	4	21.715	59.386	0.000
	Residual	85.931	235	0.366		
	Total	172.792	239			

The study's hypotheses focus on the impact of AR/VR technology usage in higher education institutions, specifically on unrelated factors. Conducting experiments to test the hypothesis given earlier results in achieving the objectives. Table 7 displays the impact of each independent variable on students' view of adopting AR/VR technology in higher educational institutions. The aforementioned theories are all noteworthy and greatly enhance people's perceptions of AR/VR technology. The research findings indicate that learners' adoption of immersive technology is most strongly influenced by their opinions of usefulness, convenience of use, and self-efficacy.

Table 7: Coefficient of Regression Model

Coefficients					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		

1	(Constant)	0.207	0.209		0.989	0.324
	Perceived ease of use	0.159	0.056	0.160	2.809	0.005
	Complexity	0.065	0.068	0.059	0.960	0.338
	Usefulness	0.266	0.065	0.246	4.067	0.000
	Self-Efficacy	0.421	0.066	0.395	6.359	0.000

DISCUSSION AND CONCLUSION

Based on the survey, the majority of students hold positive views toward the utilization of technologies such as VR and AR in higher education. By incorporating VR and AR, learners believe that they will be able to enhance their understanding of the taught ideas and improve their learning outcomes. This outcome is consistent with the available evidence. The benefits mentioned include improved focus, greater cognitive abilities such as memory and motivation, a heightened sense of reality, and even the possibility of time travel, as supported by the literature review conducted by Freina et.al. in 2015. Overall, the literature highlights the positive impacts of learners' perception towards the implementation of VR and AR technology. It is important to note that these technologies are still relatively unfamiliar to many learners, and the majority of them do not actively stay updated on new technological advancements in higher education. This article presents an analysis of students' thoughts on use of AR and VR technologies as educational aids. The results suggest that the majority of students hold positive expectations for these novel technologies. It is important to highlight that three of the study's factors, namely perceived utility, perceived ease of use, and self-efficacy, significantly impact technology adoption. There is an inverse correlation between complexity and the uptake of technology. The outcomes of this investigation support the TAM paradigm and are in line with it. Based on this study, the factors that strongly influence the adoption of technology by learners are usefulness, self-efficacy, and convenience of use. Hence, it is important to educate learners about the advantages of AR/VR technology in educational settings. Individuals must possess self-assurance in their capacity to independently handle technology, together with the motivation to ensure that the process is both satisfying and pleasurable. The pupils must get adequate instruction in order to effectively utilize immersive technology. However, most concerns were focused on the predominant usage of VR/AR for pleasure rather than education. Given the potential of new technologies to enhance the educational process, it is imperative that educators receive proper training to utilize them confidently and effectively. In order to motivate teachers to adopt new technologies, it is imperative for us to fully understand the aspects that contribute to positive attitudes towards AR and VR. If higher education institutions can fully harness these technologies, they will have the ability to modify teaching methods and the whole structure of the university to meet student's needs. The advancements in VR and AR have the capacity to greatly enhance student achievement and well-being. This includes the provision of personalized educational programs, improved distant learning experiences, enhanced research opportunities, and a more interconnected student community.

Allowing learners to directly experience their scholastic specialization can greatly help higher education. The multitude of choices, when paired with the suitable fields of study and courses, can aid institutions in fulfilling the demands for learners in a technologically sophisticated society. It is important to contemplate the use of VR/AR technology in higher education institutions, considering the potential future developments and the necessary infrastructure and support it may require. Students usually respond positively to the incorporation of AR and VR in the classroom. Given the potential benefits of these technologies, educators are enthusiastic in expanding their knowledge and understanding of them.

Limitations and scope for further research

The aforementioned analysis indicates that a comprehensive examination of various decision-making scenarios is necessary in order to draw overarching conclusions that can inform the advancement of VR/AR technology. This study proposes a comprehensive model that may be employed to analyse the influence of many aspects on students' perception of AR/VR technology in higher education. Further study is required to examine these issues across diverse groups before drawing any broad conclusions. Moreover, it is imperative to extend one's reach outside the Bangalore region. Exploring supplementary internal and external factors is also a viable alternative.

REFERENCES

Agarwal, E. Karahanna. R (2000). Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly, 24* (4), 665-694

Ajzen, I. (1991). The theory of planned behaviour: Some unresolved issues. *Organizational Behaviour and Human Decision Processes, 50* (2). 179-211

An, Z.J.; Wang, C.; Li, S.Y.; Gan, Z.D.; Li, H. (2021). Technology-Assisted Self-Regulated English Language Learning: Associations with English Language Self-Efficacy, English Enjoyment, and Learning Outcomes. *Frontier Psychology. 11,* 34–51.

Blasco-Arcas, L. Buil I, Hernández-Ortega B, Sese FJ. (2013). Using clickers in class. The role of interactivity, active collaborative learning and engagement in learning performance. *Computer Education*. 62:102–110

Bower, M. Howe, C. McCredie, N. Robinson, A. Grover. D (2014). Augmented Reality in education – cases, places and potentials. *Educational Media International, 51* (1). 1-15, 10.1080/09523987.2014.889400

Buonomo, I.; Fiorilli, C.; Benevene, P. (2019). The Impact of Emotions and Hedonic Balance on Teachers' Self-Efficacy: Testing the Bouncing Back Effect of Positive Emotions. *Frontier Psychology. 10,* 1670.

Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13* (3), 319-340

Elbeltagi, I. E-Commerce and globalisation: an exploratory study of Egypt. (2021). *Cross cultural Management: An International Journal*, *14* (3). 196-201

Grivokostopoulos, F., Kovas, K., & Perikos, I. (2020). The effectiveness of embodied pedagogical agents and their impact on students learning in virtual worlds. *Applied Sciences-Basel, 10*(5), 14.

Holt, L.; Brockett, R.G. (2022) Self-direction and factors influencing technology use: Examining the relationships for the 21st century workplace. *Computational Human Behaviour*., 28, 2075–2082.

Huang, Y. C., Backman, S. J., & Backman, K. F. (2010). Student attitude toward virtual learning in second life: A flow theory approach. *Journal of Teaching in Travel & Tourism, 10*(4), 312–334. doi:10.1080/15313220.2010.525425

Hu PJH, Hui W (2012). Examining the role of learning engagement in technology-mediated learning and its effects on learning effectiveness and satisfaction. *Decision Support System*, 53(4). 782–792

Kandalaft, Michelle , R., & et, a. (2013). Virtual reality social cognition training for young adults with high-functioning autism. *Journal of autism and developmental disorders, 43*(1), 34-44.

Li, Y., Duan, Y., Fu , Z., & Alford , P. (2012). *Br Journal Education Technology* (Vol. 43).

Luo H, Li G, Feng Q, Yang Y, Zuo M. (2021). Virtual reality in K-12 and higher education: a systematic review of the literature from 2000 to 2019. *Journal of Computer Assisted Learning, 37*(3). 887–901

Matsas E, Vosniakos GC, Batras D (2018). Prototyping proactive and adaptive techniques for human-robot collaboration in manufacturing using virtual reality. Robot Computer Integrated Manufacturing. 50, 168–180

Mehta, A. Morris, N.P. Swinnerton, B. Homer, M. (2019) The influence of values on e-learning adoption. *Computers & Education, 141,* 10.1016/j.compedu.2019.103617

Mndzebele, N. M. (2023). Attitudes of hotel managers towards EC in South Africa. *International Journal of Information and Education Technology,* 3(1). 63-66

Murillo, M. (2014) "Institution and the adoption of electronic commerce in Mexico," *Electronic Commerce Research. 4.* 201-219

Pratt, M.A. Hahn, S. (2016). Enhancing hospitality student learning through the use of a business simulation. *Journal of Hospitality, Leisure, Sports and Tourism Education, 19,* 10-18, 10.1016/j.jhlste.2016.05.001

Qirim, N. A. A. (2019). An empirical investigation of an e-commerce adoption-capability model in small businesses in new zealand. *Electronic Markets, 15* (4). 418-437

Rogers, E. (1995). *Diffusion of innovations.* Free Press.

Sahadev, S. Islam, N. (2018). Exploring the determinants of e-commerce usage in the hotel industry in Thailand; An empirical study. *Information Technology and Tourism. 17*(3). 171-180

Soltani, P. Morice, A.H.P. (2020). Augmented reality tools for sports education and training. *Computers & Education, 155,* 10.1016/j.compedu.2020.103923

Straub, E. T. (2009). Understanding technology adoption: Theory and future directions for informal learning. *Review of Educational Research, 79*(2), 625–649.

Shroff, R. Deneen, C. Ng, E.M.W. (2011). Analysis of the technology acceptance model in examining students' behavioural intention to use an e-portfolio system. *Australasian Journal of Educational Technology, 27* (4). 600-618

Ukpabi, D.C. Karjaluoto, H. (2017). Consumers' acceptance of information and communications technology in tourism. *A review Telematics and Informatics, 34* (5), 618-644, 10.1016/j.tele.2016.12.002

Venkatesh, V. Thong, J.Y.L. Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly, 36* (1). 157-178, 10.2307/41410412

Venkatesh, V. Davis, F.D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46* (2), 186-204

Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research, 11* (4). 342-365

Wang, C.H.; Shannon, D.M.; Ross, M.E.(2013). Students' characteristics, self-regulated learning, technological self-efficacy, and course outcomes in online learning. *Distance Education. 34*, 302–323.

Wojciechowski, R. Cellary, W. (2013). Evaluation of learners' attitude toward learning in ARIES augmented reality environments. *Computers & Education, 68.* 570-585, 10.1016/j.compedu.2013.02.014

Yung, R. Khoo-Lattimore, C. (2019). New realities: A systematic literature review on virtual reality and augmented reality in tourism research. *Current Issues in Tourism, 22* (17). 2056-2081, 10.1080/13683500.2017.1417359