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Research Article

The Impact of Virtual Reality Technology on Jordan's Learning Environment and Medical Informatics among Physicians

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The purpose of this study is to look into the components that affect the behavioral intention of Jordanians to use Virtual Reality Technology in the Learning Environment (VRTLE). For the educational and entertainment industries, virtual reality presents both obstacles and opportunities. The goal of this study is to determine the factors that influence VRTLE acceptance and to propose how such technology may be integrated into the educational setting of students and universities. A total of 60 students from private universities took part in the research. Among the participants, 63.3% were females and 36.7% were males. The modified UTAUT model used in this study only looked at the effects of four independent variables and two external factors, namely, acceptability (ACC) and usability (USA). Acceptability and usability have a substantial impact on student acceptance of VRTLE, according to the findings. Furthermore, as moderators, there is a major effect on both Awareness and Experience. This paper contributes significantly to the UTUAT model. It also tackles educational concerns about the transition to a virtual reality learning environment. As a result, it would be useful to look into other factors as well. As a result, a comprehensive empirical study should be designed to allow for the assessment of the effects of other variables as well.

1. Introduction

A virtual reality experience is one in which the user is entirely submerged in a synthetic environment designed to provoke sensations similar to those experienced in real life, as stated by [1]. It does this by utilizing modern computing methods and instantly transporting the user to this location, so they do not have to gaze at a screen the whole time. Because we want to be able to fully immerse ourselves in the virtual environment, we have recreated a number of different sensory experiences, including hearing, seeing, smelling, touching, and tasting. They are utilized in the entertainment industry to place viewers in the centre of the action, in the military to train service personnel for actual battle, and in the education sector to guarantee that students completely grasp the stuff that is being taught to them.

The term "virtual reality" refers to an experience that has been created in its whole by a computer (VR). Virtual reality (VR) is an artificially generated set of sounds and sights that can replicate a world with tactile, visual, auditory, and other sorts of sensory feedback. VR allows users to feel as though they are in the real world [2–5].

By using this technique, you may create an experience that might otherwise be challenging or dangerous. The fundamental advantage of virtual reality is that the user does not need to venture out of the safety and convenience of their own house in order to engage in activities within the virtual environment [6–8]. Even though the technology behind virtual reality has been there since the 1980s, the demand for virtual reality headsets has only increased over the past ten years. While whole new, cutting-edge inventions are being conceived and produced in the United States at the same

time, there are new technologies on the market, and with them come cheaper pricing and new business models. At the same time, there are also new business models [9–11]. The year 2012 saw the beginning of the infancy stage of virtual reality (VR), which was initiated by the debut of the Oculus Rift as part of a Kickstarter project. The primary objective was to lower the cost of producing a Head-Mounted Display (HMD) of good quality so that it could be purchased by the general population.

The most recent edition of the popular virtual reality headset, the Oculus Rift S, contains an LCD screen that has a resolution of 2560×1440 for each eye, an 80 Hz refresh rate, as well as positioning and tracking capabilities. In addition, the screen may be viewed from an angle that spans 110 degrees. In addition to that, it comes with headphones that feature an integrated 3D audio effect. To make virtual reality indistinguishable from the actual world, significant progress must be made in the near future. In addition, virtual reality must become inexpensive, accessible, and straightforward to use for regular people in their day-to-day lives. This is the case, as indicated by research [12–14].

2. Research Background of VR

The following are the topics covered in this section: virtual reality, the Unified Theory of Acceptance and Use of Technology (UTUAT), usability, and acceptability.

2.1. Virtual Reality. VR has a tremendous amount of potential for application in the present generation. However, it is safe to say that the entertainment industry is the most significant and widespread user of this technology. Videos and movies may attempt to immerse the viewer in their world through the use of this technology, resulting in even greater entertainment [15, 16].

However, the gaming business has the greatest user base of virtual reality technology from this sector. The difference between video games and movies is that video games allow you to manage your character and have always attempted to put you in the shoes of the characters they are playing. As a result, it was obvious that they would adopt virtual reality to further immerse us in this environment [17].

Gaming software has interactive interfaces and can be experienced by the complete body [18–20]. As a result, the user can move around in the virtual environment wearing a virtual reality headset. Furthermore, the player can communicate with the 3D creatures that are present on screen. In 2015, Global revenues from VR in the game business were $4.3 billion. Following the release of the initial prototypes of the Oculus VR and Samsung Gear VR, we have entered a new era of virtual reality technology. The VR headgear is coupled with hand controllers and tracking technology, allowing users to have an exceptional virtual reality experience [21, 22].

It is possible to have an incredibly fascinating and immersive experience using virtual reality, which could provide tremendous chances for training and development. Because virtual reality technology may be used to supplement existing training, medical trainers have the opportunity to provide their staff an opportunity to participate in a learning experience that is quite uncommon in the medical field when it comes to traditional learning channels. Virtual reality effectively provides medical professionals with the option to exercise and fine-tune new skills and information in an exceptionally realistic setting without the hazards involved with traditional training [13].

VR continues to be the most successful and extensively used choice for military training because of its ability to deliver a varied range of simulations. Traditional boot camps trained soldiers with artificial weapons, which did not provide them with real-world training opportunities. Now, with the use of virtual reality, the military is able to develop boot camps that contain caverns, motion monitors, vests, and weaponry in order to provide soldiers with better training. Extreme habitats such as the jungle and desert require navigation and coordination to be successful. Soldiers can train in such surroundings with the help of virtual reality. Military training in submarines, fighter jets, and ground vehicles is being facilitated using virtual reality. This eliminates the need for personnel to get inside actual vehicles. The virtual reality simulators also provide data and feedback on the soldiers' reactions to various scenarios. They are also used to train soldiers in combat. The information gathered about the soldier's reaction can be used to give tailored training to him or her [23–26].

Even for medical professionals where the traditional training procedure is not possible, VR can help. For example in war-like conditions, medical professionals can be placed using VR. When a trainee is placed in a virtual automobile with a prosthetic body, he or she can experience what it is like to be in a warzone. Virtual situations allow medical practitioners to practice various abilities in stressful situations without having to go to the actual hospital [27].

2.2. Unified Theory of Acceptance and Use of Technology (UTUAT). In a previous study conducted by [28], a comparison between the theories and models of user acceptance was done. This study provided the base for the UTAUT paradigm. Theory of planned behavior (TPB), technology acceptance model (TAM), and theory of reasoned action (TRA) along with other models were compared while this model was devised.

The resulting UTAUT model was developed in order to address the challenges that researchers in the field of information technology confront while developing their study frameworks, as well as to foster knowledge of technology usage among users [28, 29]. [30] noted that the acceptance models developed in the past had some success in predicting the adoption of information technology, with an approximate success rate of 40% in predicting the adoption of technology. When it comes to the uptake of information technology, it was reported that the application of UTAUT model helUSA predicted an uptake of almost 70 percent. It is also possible to use the UTAUT model to anticipate individual adoption of information technology over a wide variety of populations. Scales that have been used in earlier technological acceptability concepts and frameworks were combined to create new scales,

which were then examined to see if they could be improved further [28].

2.3. Acceptability. A critical area of research has been establishing the acceptability of utilizing VR with persons who are experiencing psychosis. This has been proved to be critical in determining the viability of employing virtual reality in this setting. All of the studies considered in this publication addressed this critical problem as part of their design. Although only three of them specifically published results on the acceptability of the technology in question. The patients' attitudes toward using a simulated reality were good, and they described performing activities by using computers as being engaging [31, 32]. Even in patients with persecutory delusions [33, 34], no increased anxiety levels were reported while they were using the VR or even after one week from the experiment.

2.4. Usability. In the field of human-computer interaction, usability characteristics are the most critical elements to consider when designing and evaluating systems. Nielsen's usability paradigm is the most widely used in the human-computer interaction (HCI) sector. Based on the factor analysis of 101 usability explanations, he developed nine usability aspects to consider [35]. His heuristics, on the other hand, are out of date. Those explanations were obtained from two character-based interfaces, six graphical user interfaces, three telephone-operated interfaces, and three virtual reality application interfaces (VR apps). This standard paradigm is unable to explain all of the phases that are involved in ubiquitous computing technology [36, 37].

Because ubiquitous computing is still in its infancy, there is no established authorised evaluation methodology that can be applied in this area of technology. Furthermore, while ubiquitous computing is associated with a plethora of domains, usability characteristics vary depending on the area in question. We have investigated the interactive design approach in order to build a ubiquitous computing environment on the university's main campus. Utilizing the results of the design process, the current study explores usability considerations for building mobile ubiquitous computing in a mobile environment. As a result, we were able to extract 16 usability elements, including 8 components specifically designed for mobile ubiquitous computing.

3. Research Model

The research hypothesis and the UTAUT are presented in the following section.

3.1. Unified Theory of Acceptance and Use of Technology (UTAUT). It is comprised of two theories proposed by UTAUT and one additional factor that is included to examine the factors that are interfering with the adoption of VR in Higher Education Institutions in the Gulf region [28]. The structures of the proposed model will be discussed in detail in this section. Acceptability and usability are two additional factors that are used to capture the effect of students from the Gulf region adopting VR in Higher Education Institutions. In this context, the condensed model can encompass the explanation of VR for students using a simplified approach (see Figure 1).

3.2. Research Hypothesis. The following are the research alternative hypothesis factors for this case study:

(H1) PE impacts directly the BI toward using the virtual reality.

(H2) EE impacts directly the BI toward using the virtual reality.

(H3) SI impacts directly the BI toward using the virtual reality.

(H4) Acceptability (ACC) impacts directly BI toward using the virtual reality.

(H5) Usability (USA) impacts directly the behavioral intention (BI) toward using the virtual reality.

(H6) Facility Conditions (FCs) impacts directly the UB toward using the virtual reality.

(H7) Awareness (Awa) moderates the association between PE and BI toward using the virtual reality.

(H8) Awareness (Awa) moderates the association between the EE and the BI toward using the virtual reality.

(H9) Awareness (Awa) moderates the association between the SI and the BI toward using the virtual reality.

(H10) Awareness (Awa) moderates the association between ACC and the BI toward using the virtual reality.

(H11) Awareness (Awa) moderates the association between USA and the BI toward using the virtual reality.

(H12) Awareness (Awa) moderates the relationship between Facility Conditions (FCs) and the Use Behavior (UB) toward using the virtual reality.

(H13) Experience (Exp) moderates the association between PE and the BI toward using the virtual reality.

(H14) Experience (Exp) moderates the association between EE and the BI toward using the virtual reality.

(H15) Experience (Exp) moderates the association between SI and the BI toward using the virtual reality.

(H16) Experience (Exp) moderates the relationship between Acceptability (ACC) and the behavioral intention (BI) toward using the virtual reality.

(H17) Experience (Exp) affects the association between USA and the BI toward using the virtual reality.

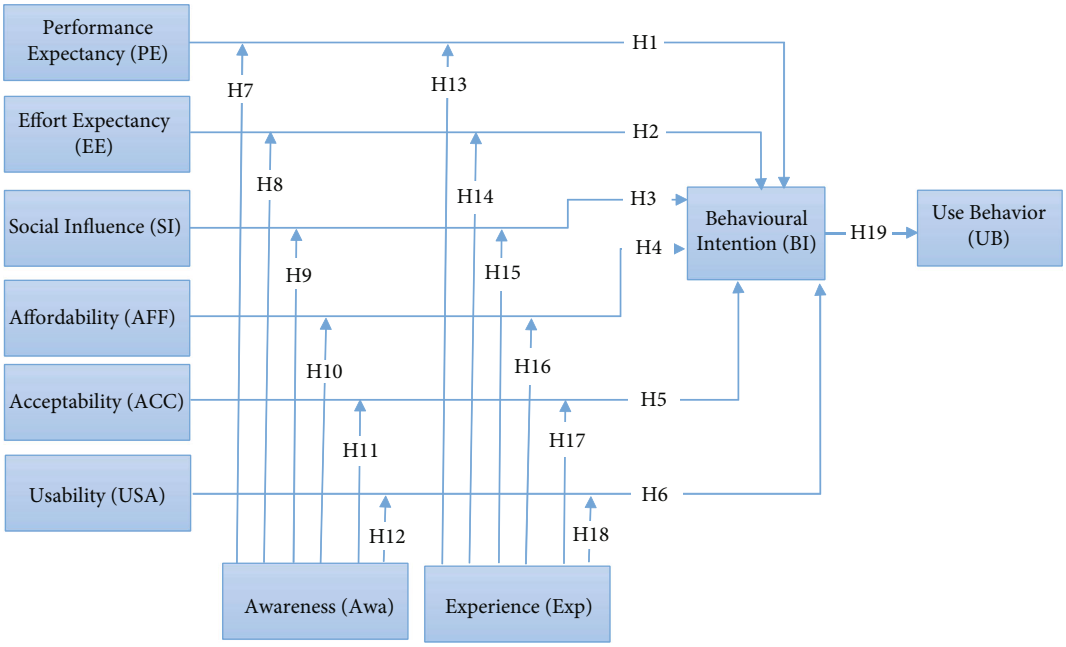

Figure 1: Conceptual framework.

(H18) Experience (Exp) affects the association between FCs and the UB toward using the virtual reality.

(H19) Behavioral intention (BI) impacts directly the Use Behavior (UB) toward using the virtual reality.

3.3. Questionnaire Development. The questionnaire is developed keeping in consideration learning in VR and using the available resources on usability, UTUAT, and acceptability (e.g., [28, 38, 39]). The instruments used by the past researchers were also used. This helps in understanding the consumer behavioral intentions. Because maximum participants were Jordanians, a translation of the original instrument from English to Arabic was performed. After several iterations of translation, the questionnaire was finally completed and published. For each item, a five-point scale was utilized to assess its importance. The scale goes from 1 to 5 with 1 being strongly disagree and 5 being strongly agree (strongly agree).

3.4. Method. Structured questionnaires were distributed to undergraduate students ($N = 1250$). All the students from universities located in the northern and southern districts of Amman, the capital of Jordan, were included. A computer-generated algorithm was used to select 451 questionnaires at random from the pool. There are 56 percent females and 44 percent males among those who took part in the study.

3.5. Survey Instrument. Based on the previous study, the questionnaire was developed. Five-point Likert scales were included. The scale evaluated effort expectancy (EE), performance expectancy (PE), facilitating conditions (FCs), behavioral intention (BI), social influences (SI), usability (USA), and acceptability (ACC). To meet the requirements, instruments used in the survey were used [39, 40].

4. Research Finding

Participants' responses and demography were discussed in the following section.

4.1. Respondent's Demography. Table 1 describes the demographic features of the participants.

63.3% were females showing female predominance. Most of the participants were 31-35 years old. 26% were of senior doctors followed by 23.3% of juniors. Among the participants, 25.0% were from medicine specialty and 18.3% from obstetrics and gynecology. The years of experience of the respondents ranged from <1 year to >10 years.

5. Data Analysis

In the present study, the conceptual model presented for behavioral intention was evaluated using SEM along with the adoption of MTLE. SEM is used in the development of confirmatory factor analysis, correlation structure models, and other applications. When doing Average Extracted Variance analyses, composite reliability (CR), and confirmative factor analysis (FL), AMOS was the tool of choice (AVE). The instrument's dependability is shown in Table 2.

Convergent and adequate reliability was reported for all the factors (0.06 and 0.8). CR > 0.6 and AVE > 0.5. Moreover, Table 3 shows internal consistency on reliability parameters.

5.1. Model Fit. The suggested method was assessed using the chi-square test based on the covariance of data. Fitting parameters are shown in Table 3. According to a previous study, it is recommended to have a root mean square error

Table 1: Demographic profile of the participants.

Characteristic	Number of respondents	Percentage of samples (%)
Gender		
Male	22	36.7
Female	38	63.3
Age		
20-25	21	35
26-30	16	26.7
31-35	23	38.3
Seniority level		
Intern	13	21.7
Junior	14	23.3
Senior	16	26.7
Chief	11	18.3
Consultant	6	10
Seniority level		
GP	5	8.3
ENT	4	6.7
Medicine	15	25
Obs & Gyne	11	18.3
USAiatrics	6	10
Surgery	7	11.7
ER	5	8.3
Nephrocyte	4	6.7
Family	3	5
Work experience (year)		
<1	14	23.3
1-3	16	26.7
4-6	12	20
7-10	8	13.3
>10	10	16.7

between 0.05 and 0.08, TLI value > 0.90, and CFI > 0.09 [41]. Hence, indicating acceptability of the model.

5.2. Moderated Effects. The study looked into the impacts of knowledge and experience on their respective effects. Modifiers are variables that accept the direction. Also, it studied the weaknesses and strengths, of a relationship between two variables [42]. The complete study group was divided into males and females. The value of chi-square and the value of df for the unconstrained model were calculated at first. Following that, the relationships were limited one at a time, and the chi-square vales were calculated. Table 4 demonstrates that the df difference is equal to one for all models. A p value of less than 0.05 indicates that the chi-square difference is significant; as a result, the link is tempered by prior experience, as shown in Table 4. All of the p values in this table are more than 0.05. The adoption of VRTLE is influenced by one's previous experience. The data sheet was divided into two age groups in order to explore the moderating influence on awareness of the situation. The sample includes 230 students who are over the age of 21 and 121 students who are under the age of 21. Each group was divided into two categories: those under 21 years of age and those above 21 years of age, respectively. It implies that $p > 0.05$; as a result, a relationship between experience and VRTLE adoption has been observed, according to the data.

Table 2: Instrument reliability.

Constructs	FL	CR	AVE	CA
PE1	0.78	0.8	0.63	0.9
PE2	0.85			
PE3	0.88			
PE4	0.84			
EE1	10.8	0.9	0.66	0.9
EE2	20.8			
EE3	30.8			
SI1	0.76	0.9	0.69	0.8
SI2	0.77			
SI3	0.79			
SI4	0.85			
FCs1	10.8	0.9	0.64	0.8
FCs2	20.9			
FCs3	30.9			
FCs4	40.9			
USA1	0.85	0.8	0.62	0.8
USA2	0.87			
USA3	0.88			
ACC1	10.7	0.8	0.61	0.8
ACC2	20.7			
ACC3	30.8			
ACC4	40.8			

6. Discussion and Implications

In this study, we looked into the willingness of Jordanian students to use VR technology. Social influences (SI), performance expectancy (PE), effort expectancy (EE), behavioral intention (BI), usability (USA), facilitating conditions (FCs), and acceptability (ACC) were the components that were used and described in this study. Because the use of virtual reality technology among students should be enhanced, higher education institutions (HEIs) must address these issues. The information gathered came from a variety of various levels of students. A wide pool of data enhances the likelihood that the outcomes are reflective of the general population. This paper proposes a model that is adapted to the specific context of Jordan.

Aspects of the UTAT are specifically incorporated into this paradigm of UTAUT. Social influences (SI), performance expectancy (PE), effort expectancy (EE), behavioral

Table 3: Model fit parameters.

Model fit parameters	x^2/df	CFI	TLI	RMSEA
Recommended value obtained	<32.774	>9.940	>9.930	<0.08.047

Table 4: Summary of hypothesis testing.

No.	Statement	*B*	Supported
H1	PE impacts directly the BI toward using the virtual reality.	0.489	Yes
H2	EE impacts directly the BI toward using the virtual reality.	0.432	Yes
H3	SI impacts directly the BI toward using the virtual reality.	0.633	Yes
H4	Acceptability (ACC) impacts directly BI toward using the virtual reality.	0.425	Yes
H5	Usability (USA) impacts directly the behavioral intention (BI) toward using the virtual reality.	0.421	Yes
H6	Facility Conditions (FCs) impacts directly the UB toward using the virtual reality.	0.652	Yes
H7	Awareness (Awa) moderates the association between PE and BI toward using the virtual reality.	0.658	Yes
H8	Awareness (Awa) moderates the association between the EE and the BI toward using the virtual reality.	0.461	Yes
H9	Awareness (Awa) moderates the association between the SI and the BI toward using the virtual reality.	0.481	Yes
H10	Awareness (Awa) moderates the association between ACC and the BI toward using the virtual reality.	0.427	Yes
H11	Awareness (Awa) moderates the association between USA and the BI toward using the virtual reality.	0.421	Yes
H12	Awareness (Awa) moderates the relationship between Facility Conditions (FCs) and the Use Behavior (UB) toward using the virtual reality.	0.654	Yes
H13	Experience (Exp) moderates the association between PE and the BI toward using the virtual reality.	0.655	Yes
H14	Experience (Exp) moderates the association between EE and the BI toward using the virtual reality.	0.642	Yes
H15	Experience (Exp) moderates the association between SI and the BI toward using the virtual reality.	0.431	Yes
H16	Experience (Exp) moderates the relationship between acceptability (ACC) and the behavioral intention (BI) toward using the virtual reality.	0.424	Yes
H17	Experience (Exp) affects the association between USA and the BI toward using the virtual reality.	0.712	Yes
H18	Experience (Exp) affects the association between FCs and the UB toward using the virtual reality.	0.781	Yes
H19	Behavioral intention (BI) impacts directly the Use Behavior (UB) toward using the virtual reality.	0.731	Yes

intention, usability (USA), facilitating conditions (FCs), and acceptability (ACC) of the students' behavioral Intention (BI) will increase if they are convinced that using VR technology they can receive better information from the institute. The intention to use of these pupils would also grow if these students had greater control over their interactions when interacting with virtual reality technologies. Students' understanding of the services that are available to them through Interaction Techniques in VR should be raised, and as a result, higher education institutions should launch an awareness campaign to raise student awareness. Furthermore, higher education institutions must not overlook current technologies, particularly social media. As a result, HEIs should adopt the new media and leave the traditional one so that they are able to give students with real-time information.

7. Limitation

Several limitations have been identified by this investigation.

First and foremost, despite the fact that VR technology is still in its infancy around the world, only virtual reality students in Jordan were taken into consideration for this study. The samples acquired from Jordanian universities are often youthful and highly educated, according to research published in the virtual reality literature. This is in contrast to the samples utilized in other countries' studies, which were drawn from the general population. Therefore, the factors that were analyzed and identified on the behavioral Intention (BI) toward utilizing virtual reality were as follows: Students are only permitted to study in Jordan. Therefore, future studies should compare their findings with those reported in studies conducted elsewhere in the world.

Next, this study's use of the modified UTAUT model: it only investigated the effects of four independent variables and two external factors, i.e., the acceptability (ACC) and usability (USA) variables. As a result, it would be good if additional issues were explored as well. Therefore, a complete empirical research design should be developed to allow for the evaluation of other aspects in addition to those included in the original study.

Third, this research focuses on the intention of consumers to use virtual reality technology in relation to certain products. The purchasing intention of consumers following the use of M-marketing is the most frequently encountered issue among industries. The findings of this research could be extended in the future by researchers, merchants, and producers, allowing for the investigation of the relationship between virtual reality usage and the intention of virtual reality students to continue purchasing virtual reality products.

Furthermore, other industries could also be the focus of future research in the coming years.

Fourth, the model established in this study might be used and enhanced in a future study by integrating more constructs such as the construct of service quality and the construct of computer self-efficacy, as well as other variables.

Finally, VR is one of the technologies with the greatest estimated potential for growth in the near future. Right now, the majority of the experience they deliver to the ordinary user is primarily auditory and visual. It still has a long way to go before it can simulate the senses of touch, smell, and other sensations fully. Additionally, virtual reality is not currently user-friendly or viable. Users must have a separate area with plenty of free space dedicated solely to virtual reality. It must be wired and cabled in a tangle of different ways. Aside from that, wearing the bulky headset for extended periods of time is not an option. These limits will undoubtedly be solved in the future, and a more immersive experience will almost certainly be reached.

8. Conclusion

When it comes to the educational and entertainment industries, virtual reality presents both obstacles and potential. Virtual reality technologies have the potential to be used as an instructional and training tool because they are entirely controllable, practical, and not in any way dangerous. As 3D visualisation technology advance, a greater variety of education and training materials may be used in virtual reality environments, allowing for greater flexibility in curriculum design. Virtual reality holds a great deal of potential for the future since it provides a user with an immersive experience. As a result, businesses may take advantage of this important feature and move their products and services one step farther forward. Despite all of the challenges, the virtual reality business is growing, particularly in the gaming and corporate categories. In the foreseeable future, there is a strong likelihood that virtual reality will become widely used. As a result, it is clear that firms who begin integrating virtual reality technologies into their operations will have a strong chance of dominating the industry.

The development of VR technology in wealthy countries has accelerated during the previous decade, particularly in Japan. This has piqued the interest of developing countries, particularly those in the Middle East, because these governments see the need of being a player in the field of virtual reality technology and the substantial value of doing so. Arab countries, particularly those located in the Middle East, must make use of Internet technology, notably in the educational field. Unfortunately, virtual reality consumers continue to lag behind in nearly all nations in the Middle East, particularly when it comes to the variety of ways in which VR technology is being used. In truth, there are very few virtual reality applications available in Arab countries. The outcomes achieved by this study meet the study's primary goal, which was to raise behavioral Intention (BI) toward employing virtual reality technology. Among Arab pupils, for example, the expansion in the number of Arab virtual reality applications is predicted to encourage learners to shift their process of learning intentions in favour of VR applications as a result of this increase. As a result, the learning process in Arab countries will be improved. The research provides a verified framework model for the implementation of virtual reality applications in both education and industry. This work also contributes to the body of knowledge on a fundamental level, which is a positive development. The outcomes of this study can be used as a crucial guideline for both academics and business development practitioners in their day-to-day business development practices.

Data Availability

A total of 60 students from private universities took part in the research. Among the participants, 63.3% were females and 36.7% were males.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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