Information Technology Students' Perceptions Toward Using Virtual Reality Technology for Educational Purposes

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Abstract—This study aims to examine information technology students' perceptions toward the use of virtual reality technology, their behavioral intention to use such technology for educational purposes, and the relationship between their perceptions toward the use of virtual reality technology and their behavioral intention to use virtual reality technology for educational purposes. The study used a descriptive and cross-sectional survey research design. The data collection tool was developed based on the second Unified Theory of Acceptance and Use of Technology UTAUT2 framework. Data were collected from participants using an online questionnaire. The number of participants was 147 undergraduate information technology students. The results showed that the participants had variations in their perceptions of virtual reality technology. The results showed that participants had positive perceptions of hedonic motivation and effort expectancy concerning the use of virtual reality. However, the students had close to neutral perceptions of performance expectancy, social influence, facilitating conditions, price value, and habits concerning the use of virtual reality. Furthermore, the results showed that the students had a positive behavioral intention to use virtual reality for educational purposes. Part of students' positive behavioral intention to use virtual reality for educational purposes can be ascribed to their perceptions of effort expectancy, performance expectancy, social influence, hedonic motivation, price value, facilitating conditions, and habits concerning the use of virtual reality. Students' perceptions of performance expectancy concerning virtual reality had the greatest effect on their behavioral intention to use virtual reality for educational purposes. Based on the findings, a set of recommendations was provided.

Keywords—virtual reality, information technology, students' perceptions, UTAUT2

1 Introduction

The current era is characterized by the increase in knowledge and rapid development in various fields, especially in information technology, communication technology, and

educational technology. The recent developments in information and communication technologies have strongly pushed the wheel of scientific and technological progress. Therefore, educational stakeholders need to keep abreast of the rapid developments in the technological fields. Coping with the technological fields has become one of the requirements of this era. One of the most important technological developments in our time is the emergence of the so-called virtual reality technology. Virtual reality is cutting-edge technology that has experienced fast growth and adoption as a tool to improve educational processes. Virtual reality technology refers to the formation of three-dimensional environments using computer graphics and simulators so that individuals can sense it with his/her different senses and interact with it (Onyesolu & Eze, 2011). Virtual reality technology shows user phenomena that are difficult to imagine regardless of location without being exposed to potential risks if they were observed in nature. Virtual reality technology highlights these phenomena in a way that makes them close to the truth, enabling students to understand their components (Daineko, Ipalakova, Tsoy, Bolatov, Baurzhan, & Yelgondy, 2020). A virtual reality environment is built based on a three-dimensional and computer-generated environment in which users can sense such an environment rather than just observe it. They can interact with such environments, they can receive sensory input, and can move from one place to another in these environments (Huang, Rauch, & Liaw, 2010; Checa & Bustillo, 2020).

Virtual reality is referred to by various names such as virtual environment, artificial worlds, metaverse, artificial reality, virtual worlds, fictional universe, or cyberspace (Alqahtani, Daghestani, & Ibrahim, 2017). Virtual reality technology can be defined as a multi-purpose, computer-generated environment in which the user actively engages with the content and effectively participates in the activities through freedom of movement, interaction, and navigation (Chen, 2015). In addition, virtual reality technology can be viewed as a three-dimensional environment created by the computer so that users can explore and interact with it. Users can immerse themselves in this three-dimensional digital world and deal with objects or perform tasks and activities within this environment (Pirker, Lesjak, & Guetl, 2017). Virtual reality can be broadly characterized as computer simulations that allow users to visualize the invisible (Zhao & Lucas, 2015).

Virtual reality can be classified based on the level of immersion. Immersion is when a user is unaware that they are in a synthetic and computer-generated environment (Blascovich, 2002). Based on the level of immersion, virtual reality can be classified into low immersive, semi-immersive, and fully immersive virtual reality (Martirosov, Bureš, & Zítka, 2022). In a fully immersive virtual reality environment, the users do not feel the surrounding real world; they feel only the computer-generated environment that they can interact with and navigate (Weiss & Jessel, 1998). Navigation in a fully immersive virtual reality environment requires a special Head-Mounted Display (HMD) or digital glasses connected to the computer (Freina & Ott, 2015). In addition, in a fully immersive virtual reality environment, the users might wear electronic gloves in their hands as an additional way to embody virtual reality by touching the objects that are embodied in this imaginary reality (Perret & Vander Poorten, 2018). Conversely, in a low or non-immersive virtual reality environment, the virtual environment is seen and dealt with through a computer or Smartphone screen (Vergara, Rubio, &

Lorenzo, 2017). Models for low or non-immersive virtual reality environments are websites on the internet or electronic gaming devices. A popular example of a non-immersive virtual reality environment is a second-life multimedia platform. Semi-immersive virtual reality environment is similar to a low-immersive virtual reality environment in being seen on a computer screen. Still, it requires using supplementary electronic tools such as data gloves or glasses. The three types of virtual reality technology vary in the level of interaction, simplicity, required tools, and price. A fully immersive virtual reality environment represents the most sophisticated and expensive type of virtual reality that provides the highest level of interaction and requires sophisticated tools (Onyesolu & Eze, 2011).

Virtual technology has been adopted in different fields to facilitate training. Examples of these fields include science, medicine, art, tourism, architecture, engineering, education, and the military (Wohlgenannt, Simons, & Stieglitz, 2020). In educational settings, virtual reality provides several advantages that include allowing students to envisage complex phenomena and abstract concepts (Salzman, Dede, Loftin, & Chen,1999), allowing students to observe hard-to-observe events such as the interaction of atoms (Jiugen, Jing, & Ruonan, 2020), providing stimulating, students-centered, significant, pleasant, collaborative hands-on learning environment (Dickey, 2005; Jarmon, Traphagan, Mayrath, & Trivedi, 2009; Fransson, Holmberg, & Westelius, 2020; Pellas, Mystakidis, & Kazanidis, 2021).

The literature shows that virtual reality technology has proven to be an effective educational tool to enhance students' performance and achievement in various disciplines such as math, English, engineering, and science (Radhamani, Sasidharakurup, Sujatha, Nair, Achuthan, & Diwakar, 2014; Alhalabi, 2016; Pellas, Mystakidis, & Kazanidis, 2021). In addition, virtual reality technology was used to enhance students' motivation (Han & Yin, 2021), students' physical and sports skills (Li, Yi, & Gu, 2021), students' critical thinking (Kang, Hong, & Lee, 2020), students' attitude toward the use of technology (Tüysüz, 2010), students' creative thinking (Hu, Wu, & Shieh, 2016), and life skills for students with special needs (Jeffs, T2010). Virtual technology has been used in various educational settings that, include k-12 and higher education (Pellas, Mystakidis, & Kazanidis, 2021).

Virtual reality technology has significant importance in the information technology field. The students in information technology should be more aware of virtual reality technology than other students in different fields since it is part of the information technology curriculum. Information technology students are expected to be future experts in virtual reality technology who would be responsible for creating and implementing virtual technology in different fields and providing training on how to use virtual reality. In addition, virtual reality technology can be used to facilitate the teaching and learning process in the information technology field (Alfalah, 2018; Srimadhaven, Harshith, & Priyaadharshini, 2020).

Despite the evident benefits of virtual reality technology in training in different fields, individuals differ in their adoption and acceptance of it. Fransson, Holmberg, and Westelius (2020) found that various factors influence the spread of virtual reality technology in the educational context. These factors are related to the price of technol-

ogy, ease of use, availability of the required resources and support to use the technology, educational benefits, and potential users' competence concerning virtual reality technology.

Virtual reality technology is an important emerging technology with several applications in various fields. Virtual reality technology provides several benefits in education and training. Virtual reality technology is part of the information technology curriculum, and virtual reality technology can facilitate teaching and learning in the information technology field. Information technology students would be future experts in virtual reality technology. Therefore, there is a need to understand information technology students' perceptions of virtual reality technology and their behavioral intention to use such technology for educational purposes. In the current study, the factors used to measure students' perceptions of virtual reality technology were aligned with the UTAUT2 framework (Venkatesh, Thong, & Xu, 2012).

The following sections of this paper are organized as follows. The second section describes the used theoretical framework. The third section discusses the previous studies related to the current research topic. The fourth section addresses the used methodology in terms of the research design, research questions, description of participants, description of the data collection tool and data collection procedure, and description of the process of data analysis. The fourth section presents the results and discussion, while the fifth section presents the conclusion and recommendations.

2 Theoretical framework

The process of adopting innovation by individuals has been investigated in different theories. For instance, Rogers (1995) proposed that potential users would be more likely to adopt innovations that are easy to use, useful, consistent with their beliefs and experiences, and testable and observable. Innovation in Rogers's (1995) theory might refer to a new idea, method, or technology. Another important theory concerning the adoption of new technology is the Technology Acceptance Model (TAM) (Davis, 1989), which proposes that perceived usefulness and perceived ease of use are the two elements that affect whether potential users will embrace new technology. Venkatesh, Morris, Davis, and Davis (2003) presented the Unified Theory of Acceptance and Use of Technology (UTAUT) in a more comprehensive technology acceptance model. UTAUT showed that individuals' acceptance of the technology is affected by their perceptions of effort expectancy, performance expectancy, social influence, and facilitating conditions concerning such technology. In an extended version of UTAUT, Venkatesh, Thong, and Xu (2012) presented UTAUT2 that shows that behavioral intention to use technology is affected by seven factors: effort expectancy, performance expectancy, and social influence, facilitating conditions, hedonic motivation, price value, and habit.

In the context of technology acceptance, effort expectancy in UTAUT2 refers to the extent a user thinks using technology would be effortless (Davis, 1989, Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012). Performance expectancy UTAUT2 refers to the extent a user thinks utilizing a technology would enhance

his/her ability to execute his/her job (Davis, 1989, Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012). Social influence refers to the extent a user thinks that important individuals for him/her believe that he/she should adopt and use a technology (Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012). Facilitating conditions refer to the availability of technological and organizational infrastructure and support to assist a user's adoption of a technology (Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012). Hedonic motivation refers to the extent to which the users believe that the use of technology will bring pleasure or delight to him/her (Venkatesh, Thong, & Xu, 2012). Price value refers to the user's cognitive trade-off between technology's ostensible advantages and associated costs (Venkatesh, Thong, & Xu, 2012). Habit refers to the extent to which a user tends to act in certain ways naturally or automatically (Venkatesh, Thong, & Xu, 2012). Behavioral intention refers to the intensity of a user's desire to engage in a particular behavior (Davis, 1989, Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012). UTAUT2 and extensions versions of UTAUT2 were widely used to examine individuals' acceptance of a variety of technologies for educational purposes, such as learning management systems (LMSs) (Ain, Kaur, & Waheed, 2016) Massive Open Online Learning Courses (MOOCS) (Tseng, Lin, Wang, & Liu, 2022) Mobile phone (Nikolopoulou, Gialamas, & Lavidas, 2020) mobile learning (Arain, Hussain, Rizvi, & Vighio, 2019) mobile-based educational application (Ameri, Khajouei, Ameri, & Jahani, 2020).

In the current study, the UTAUT2 was used to guide the investigation regarding information technology students' perceptions toward and intention to use virtual reality technology for educational purposes. In the current study, behavioral intention is defined as the intensity of information technology students' desire to use virtual reality technology for educational purposes. The constructs of UTAUT2 that would affect students' intention to use virtual reality technology were measured by addressing virtual reality technology. Figure 1 shows the research model used in the current study based on UTAUT2 (Venkatesh, Thong, & Xu, 2012).

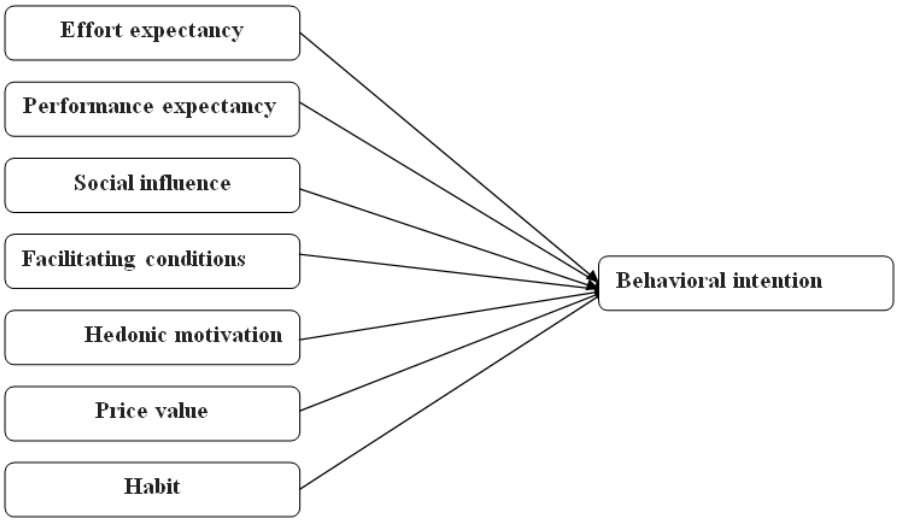

Fig. 1. The used research model that was modified from UTAUT2 (Venkatesh, Thong, & Xu, 2012)

3 Literature review

University students' perceptions of virtual reality technology have been investigated in a range of research. For instance, Baxter and Hainey (2019) examined higher education students' perceptions of virtual reality in their education in the United Kingdom. The research followed a mixed research design in which data was collected using a questionnaire with closed-ended and open-ended questions. The number of participants was 100 students. The findings showed that the students believed virtual reality has useful pedagogical applications in a learning environment. The main obstacles or challenges to using virtual reality in higher education were the cost of virtual reality technology, potential health risks, and difficulties adapting to its use. Another study focused on students' and instructors' perceptions of virtual reality in higher education. Jin, Liu, Yarosh, Han, and Qian (2022) interviewed 18 students and faculty members at a university in the United States regarding the educational potential of virtual technology in higher education. The results showed that the participants believed virtual reality would provide several educational benefits. These benefits include improving social engagement, accessing difficult-to-access educational environments, improving comprehension and memory of visual and spatial knowledge, supporting experiential learning, and attracting learners via innovation. However, the participants reported some obstacles to the use of virtual reality. These obstacles were related to cost, health concerns, and available support. In another study that was conducted in the United Kingdom, Detyna and Kadiri (2020) examined the educational potential of immersive virtual technology based on educational trials that employed virtual reality. The researchers used closed-ended quantitative questions and open-ended qualitative questions to collect data from

70 university students. The results showed that the students believed that virtual technology was easy to use and useful in improving their comprehension and participation in the educational process. Some of the previous studies focused on students' perceptions of the use of virtual reality technology in specific educational fields. For instance, Hagge (2021) examined university students' perceptions of virtual reality technology and its use in geography courses. The researcher measured students' perceptions of virtual reality technology before and after the use of virtual reality technology in their education. A questionnaire instrument was used to collect data from more than 110 students. The results showed that the participants believed in both surveys that the uses of virtual technology were useful and would like to use it in their education.

University students' acceptance of virtual reality technology for educational purposes and the factors that would affect their acceptance of such technology has been examined worldwide using various technology acceptance models to guide the investigation. For instance, in Taiwan, Shen, Ho, Ly, and Kuo, (2019) conducted a study to examine the factors that would affect university students' behavioral intentions of using virtual reality in learning. These factors were based on UTAUT and Kolb's learning styles. The study followed a descriptive research design in which 376 students from different disciplines completed a questionnaire. The findings indicated that only the concrete experience mode of Kolb's learning styles positively and significantly impacted students' behavioral intention to use virtual reality in learning. In contrast, all four UTAUT components positively and significantly impacted students' behavioral intention to use virtual reality in learning.

In another study in Malaysia, Abd-Majid and Shamsudin (2019) investigated the elements influencing virtual reality's acceptability in classrooms among graduate university students. The researchers used TAM. The research followed a quantitative approach in which data were collected using a cross-sectional survey. The number of participants was 98 students. The results showed that perceived usefulness and attitude toward virtual reality technology directly affected students' behavioral intention to use virtual reality technology, while perceived ease of use would indirectly affect students' behavioral intention to use virtual reality technology. In the United States, Fussell and Truong (2021) examined the factors that make students more likely to utilize virtual reality for studying in an active learning educational setting. The researchers employed a cross-sectional survey design in which 310 aviation students were invited to complete a questionnaire. An extended version of TAM was used to guide the investigation. Perceived enjoyment and performance expectancy were the two factors that were used to extend TAM. The results showed that students believed that ease of use, usefulness, and enjoyment positively impacted their attitude toward virtual reality, and their attitudes positively impacted their behavioral intention to use virtual reality in the educational process. In another study, Huang and Liaw (2018) conducted a study that aimed to examine university students' behavioral intention toward using virtual reality in their learning and the factors that would affect their intention. These factors were based on TAM and constructivism. The study followed a descriptive research design in which 308 students in e-commerce courses completed a questionnaire. The findings indicated that learning motivation, perceived ease of use, and perceived usefulness were three important elements directly influenced learners' desire to use the virtual reality learning

environment. In addition, the results showed that self-efficacy and perceived interaction indirectly affected students' behavioral intention to use virtual reality.

Based on the reviewed literature, the purpose of the current study is similar to the purposes of some previous studies that examined university students' perceptions of the use of virtual reality (Baxter & Hainey, 2019; Detyna & Kadiri, 2020; Hagge, 2021; Jin, Liu, Yarosh, Han, & Qian, 2022;) as well as to the studies that examined the factors that would affect students' behavioral intention to use and actual use of virtual reality for educational purposes (Huang & Liaw, 2018; Shen, Ho, Ly, & Kuo, 2019; Abd-Majid & Shamsudin, 2019; Fussell & Truong, 2021;). In addition, the research methodology in the current study is similar to the research methodology in the previous studies that used a cross-sectional survey design (Shen, Ho, Ly, & Kuo, 2019; Abd-Majid& Shamsudin, 2019; Hagge, 2021; Fussell & Truong, 2021; Huang & Liaw, 2018), while the research methodology in the current study differs from the research methodology in other previous studies that employed qualitative design and mixed research design (Baxter & Hainey 2019; Detyna & Kadiri, 2020; Jin, Liu, Yarosh, Han, & Qian, 2022). The participants in the current studies were university students who were majoring in information technology. The participants differ from the participants in the previous studies that collect data from university students from different disciplines (Shen, Ho, Ly, & Kuo, 2019), geography field (Hagge, 2021), and economy field (Huang & Liaw, 2018). Furthermore, the current study differs from the previous one in employing UTAUT2 to guide the investigation and develop the data collection tool. While the previous studies used different theoretical formworks to examine the factors that would affect students' behavioral intention to use virtual reality in their education, including UTAUT and Kolb's learning styles (Shen, Ho, Ly, & Kuo, (2019) TAM (Abd-Majid& Shamsudin, 2019) extended TAM (Fussell & Truong, 2021) and TAM and constructivism (Huang & Liaw, 2018).

4 Method

This study was quantitative. It employed a descriptive, cross-sectional research design. The data were collected at one point in time using a questionnaire. The following sub-sections present the research questions, description of participants, description of the data collection tool and data collection procedure, and description of the process of data analysis.

4.1 Research questions

- First research question: What are the perceptions of information technology students toward using virtual reality technology in terms of performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit?
- Second research question: What are the behavioral intentions of information technology students toward using virtual reality technology for educational purposes?

- Third research question: What is the relationship between information technology students' perceptions toward the use of virtual reality technology and their behavioral intentions toward using this technology for educational purposes?

4.2 Participants

The number of participants in the current study was 147 from the college of the information technology department. About three-quarters (*n=111, 75.5%)* of the participants were male students. The great majority (n=94, 63.9%) were in the age range between 18 and 20 years old. The majority of the students (n=59, 40.1%) were in their first academic year. Table 1 shows the participants' distribution based on their gender, age, and academic year.

Table 1. Participants ' distribution based on their gender, age, and academic year (N=147)

	Group	Frequency	Percent
Gender	Male	111	75.5
	Female	36	24.5
Age	18-20	94	63.9
	21-25	49	33.3
	26-30	2	1.4
	31-35	1	.7
	More than 36	1	.7
Academic year	1	59	40.1
	2	34	23.1
	3	29	19.7
	4	24	16.3
	Missing	1	.7

4.3 Data collection tool and data collection procedure

The current study employed a questionnaire instrument to collect data from participants. The questionnaire instrument was developed based on previous studies (Venkatesh, Thong, & Xu, 2012. Mouakket & Al-hawari, 2012; Rojas-Osorio, & Alvarez-Risco, 2019). The questionnaire consisted of nine sections. The first part collected data regarding participants' demographic variables, including gender, age, and academic year. The second to the eighth sections collected data regarding students' perceptions of effort expectancy, performance expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit concerning virtual reality, respectively. The ninth section consisted of questions that aimed to examine participants' behavioral intention to use virtual reality in their education. The questionnaire instrument was translated into Arabic, and the students completed the Arabic version. The validity of the questionnaire was checked by sending the questionnaire to a panel of experts who reviewed the final version of the questionnaire. The panel of experts consisted of faculty members from various fields related to the use of virtual reality at a university in Jordan.

The reliability of the questionnaire instrument was checked using Cronbach's alpha. Cronbach's alpha was computed for each sub-scale in the questionnaire. The values of the questionnaire Cronbach's alpha indicated acceptable to a very good level of reliability of the questionnaire sub-scales. Table 2 shows the reliability statistics.

The data collection process started in the first semester of the academic year of 2022/2023. An online questionnaire was developed using Google Forms®. The electronic link to the online questionnaire was posted on the used digital learning management system. All the students in the information technology department were invited to complete the questionnaire. Participation in the study was voluntary.

Table 2. Reliability statistics

Scale	Number of Items	Cronbach's alpha
Effort Expectancy (EE)	4	.84
Performance Expectancy (PE)	4	.83
Social Influence (SI)	3	.83
Facilitating Conditions (FC)	4	.73
Hedonic Motivation (HM)	3	.86
Price Value (PV)	3	.75
Habit (HT)	4	.79
Behavioral Intention (BI)	6	.94

4.4 Data analysis

To answer the first research question regarding information technology students' perceptions toward the use of virtual reality technology in terms of their perceptions of the effort expectancy, performance expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit concerning virtual reality, the means, and standard deviations were computed for each item in these sub-scales and the total for each sub-scale. To answer the second research question regarding information technology students' behavioral intention to use virtual reality in their education, the means and standard deviations were computed for each item in the behavioral intention scale and the total for the behavioral intention scale. To answer the third research question regarding the relationship between information technology students' perceptions toward the use of virtual reality technology and their behavioral intentions toward using virtual reality technology for educational purposes, correlation coefficients were computed to measure the relationship between students' perceptions of each of the following factors: effort expectancy, performance expectancy, social influence, hedonic motivation, price value, facilitating conditions, and habit concerning virtual reality and their behavioral intention to use of virtual reality in their education. In addition, regression analysis was conducted to determine the strength of the impact of the students' perceptions of each of the following factors: effort expectancy, performance expectancy, social influence, hedonic motivation, price value, facilitating conditions, and habit concerning the use of virtual reality and their behavioral intention to use of virtual reality in their education.

5 Results and discussions

First research question: What are the perceptions of information technology students toward the use of virtual reality technology in terms of performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit?

The means and standard deviations for students' responses to the perceptions dimensions were computed to answer the first research question. The students responded most favorably to the hedonic motivation sub-scale (M=4.16, SD=.89), while they responded least favorably to the social influence dimension (M=2.81, SD=1.11). The findings indicated that the participants enjoyed using virtual reality. Such findings might be attributed to the popularity of virtual reality in computer games since this technology is relatively new for university students in Jordan. In addition, the findings indicated that the participants did not get that much support from friends and family to use virtual reality. Such findings might be attributed to the reputation of virtual reality for entertainment rather than education. The major of students in the information technology fields made most of the students agree (M=3.57, SD=.96) that the use of virtual reality would be easy and effortless. The findings indicated that the participants were not regular users of virtual reality, where they responded close to neutral (M=2.86, SD=.96) regarding whether the use of virtual reality became a habit for them or not. Furthermore, the participants responded close to neutral on the performance expectancy dimension (M=3.26, SD=1.10), indicating that they are still not fully aware of the possible usefulness of virtual reality in their education and future career. In addition, the participants responded close to neutral on the facilitating conditions dimension (M=3.09, SD=.88) and price value dimension (M=3.08, SD=.91), indicating that the participants are still not entirely aware of the price of the different types of virtual technology, and they did not experience organizational and technical support to use virtual technology. The findings aligned with the findings of previous studies that showed that students believed that virtual reality is easy to use (Detyna & Kadiri, 2020). However, the findings did not align with the findings of previous studies that showed that the students believed that virtual reality was useful for them and they had difficulties adapting to its use (Baxter & Hainey, 2019; Detyna & Kadiri, 2020; Jin, Liu, Yarosh, Han, & Qian, 2022). Furthermore, the findings aligned with the finding of some previous studies in terms of the cost issue of virtual reality (Baxter & Hainey, 2019; Jin, Liu, Yarosh, Han, & Qian, 2022). Table 3 shows the means and standard deviations for students' responses to the sub-scales that measured their perceptions toward the use of virtual reality technology.

Table 3. Means and standards deviations for students' responses to the sub-scales that measured their perceptions toward the use of virtual reality technology

N	Item	M	SD
	Effort Expectancy (EE)		
1.	EE1. Learning how to use virtual reality technology is easy for me.	3.61	1.21
2.	EE2. My interaction with virtual reality technology is clear and understandable.	3.33	1.20
3.	EE3. I find virtual reality technology easy to use.	3.52	1.20
4.	EE4. It is easy for me to become skillful in using virtual reality technology	3.82	1.05
	Total	**3.57**	**.96**
	Performance Expectancy (PE)		
1.	PE1. I find virtual reality technology useful in my daily life.	3.16	1.34
2.	PE2. Using virtual reality technology increases my chances of achieving things that are important to me.	3.33	1.34
3.	PE3. Using virtual reality technology helps me accomplish things more quickly.	3.36	1.39
4.	PE4. Using virtual reality technology increases my productivity.	3.21	1.33
	Total	**3.26**	**1.10**
	Social Influence (SI)		
1.	SI1. People who are important to me think that I should use virtual reality technology.	2.71	1.32
2.	SI2. People who influence my behavior think that I should use virtual reality technology.	2.78	1.27
3.	SI3. People whose opinions I value prefer that I use virtual reality technology.	2.93	1.27
	Total	**2.81**	**1.11**
	Facilitating Conditions (FC)		
1.	FC1. I have the resources necessary to use virtual reality technology.	2.57	1.21
2.	FC2. I have the knowledge necessary to use virtual reality technology.	3.20	1.25
3.	FC3. Virtual reality technology are compatible with other technology and applications I use.	3.07	1.11
4.	FC4. I can get help from others when I have difficulties using virtual reality technology.	3.51	1.14
	Total	**3.09**	**.88**
	Hedonic Motivation (HM)		
1.	HM1. Using virtual reality technology is fun.	4.18	.98
2.	HM2. Using virtual reality technology is enjoyable	4.24	.96
3.	HM3. Using virtual reality technology is very entertaining.	4.07	1.08
	Total	**4.16**	**.89**
	Price Value (PV)		
1.	PV1. Virtual reality technology has reasonable price.	2.70	1.22
2.	PV2. Virtual reality technology is a good value for the money.	3.35	1.05
3.	PV3. At the current price, virtual reality technology provides a good value.	3.20	1.06
	Total	**3.08**	**.91**
	Habit (HT)		
1.	HT1. Using virtual reality technology has become a habit for me.	3.04	1.25
2.	HT2. I am addicted to using virtual reality technology.	2.26	1.21
3.	HT3. I must use virtual reality technology.	3.69	1.18
4.	HT4. Using virtual reality technology has become natural to me.	2.44	1.30
	Total	**2.86**	**.96**

Second research question: What are the behavioral intentions of information technology students toward using virtual reality technology for educational purposes?

The means and standard deviations for students' responses to the behavioral intention scale were computed to answer the second research question. Most students agreed (*M=3.60, SD=1.10*) that they have a positive behavioral intention to use virtual reality for educational purposes. Table 4 shows the means and standard deviations for students' responses to each item on the scale that measured their behavioral intention to use virtual reality technology for educational purposes.

Table 4. Means and standard deviations for students' responses to the scale that measured their behavioral intention to use virtual reality technology for educational purposes

N	Item	Mean	SD
	Behavioral Intention (BI)		
1.	BI1. I intend to use virtual reality technology in the future for educational purposes.	3.73	1.26
2.	BI2. I will always try to use virtual reality technology in my education.	3.51	1.21
3.	BI3. I plan to use virtual reality technology frequently for educational purposes.	3.46	1.34
4.	BI4. I recommend virtual reality technology to my classmates for educational purposes.	3.61	1.25
5.	BI5. I encourage my friends to use virtual reality technology in their education.	3.59	1.25
6.	BI6. I intend to increase my use of virtual reality technology for educational purposes.	3.71	1.25
	Total	**3.60**	**1.10**

Third research question: What is the relationship between information technology students' perceptions toward the use of virtual reality technology and their behavioral intentions toward using this technology for educational purposes?

To answer the third research question, correlation coefficients were computed to measure the relationship between students' perceptions of each of the following factors: effort expectancy, performance expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit concerning virtual reality and their behavioral intention to use of virtual reality in their education. The results showed positive and significant relationships between students' perceptions of effort expectancy, performance expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit concerning virtual reality and their behavioral intention to use virtual reality in their education. The strongest relationship was between students' perceptions of performance expectancy concerning virtual reality and their behavioral intention to use virtual reality in their education ($r(145) = .633$, $p < .05$). The weakest relationship was between students' perceptions of price value concerning virtual reality and their behavioral intention to use of virtual reality in their education ($r(145) = .329$, $p < .05$). Table 5 shows the correlation array among students' perceptions and their behavioral intentions toward using this technology for educational purposes.

Table 5. Correlation array among students' perceptions and their behavioral intentions toward using this technology for educational purposes

	BI	EE	PE	SI	FC	HM	PV	HT
BI	1							
EE	.375**	1						
PE	.633**	.408**	1					
SI	.511**	.370**	.638**	1				
FC	.448**	.539**	.472**	.572**	1			
HM	.365**	.406**	.340**	.244**	.315**	1		
PV	.329**	.271**	.371**	.456**	.426**	.344**	1	
HT	.447**	.390**	.609**	.650**	.551**	.172*	.363**	1

* * Significant at 0.01
* Significant at 0.05

In addition, regression analysis was conducted to determine the strength of the impact of the students' perceptions of effort expectancy, performance expectancy, social influence, hedonic motivation, price value, facilitating conditions, and habits concerning the use of virtual reality and their behavioral intention to use of virtual reality in their education. The results showed that the tested participants' perceptions concerning the use of virtual reality significantly predicted participants' behavioral intention to use virtual reality in their education. The results of the regression indicated the seven predictors explained 42.6% of the variance ($R2=.45$, $F(7,139)=16.49$, $p<.01$). However, It was found that perceived performance expectancy was the factor that significantly predicted participants' behavioral intention to use of virtual reality in their education ($\beta = .44$, $p<0.01$). Table 6 shows the regression coefficients.

The findings aligned with the findings of previous studies that showed that UTAUT components had a positive and significant impact on students' behavioral intention to use virtual reality in their learning (Shen, Ho, Ly, & Kuo, 2019). In addition, the findings aligned with the findings of previous studies that showed the significant importance of and the direct effect of performance expectancy on students' behavioral intention to use virtual reality in learning (Huang & Liaw, 2018; Abd-Majid & Shamsudin 2019; Fussell & Truong, 2021). Besides the examined factors, the findings indicated that more factors would affect students' behavioral intention to use virtual reality in their learning.

Table 6. The regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	*Std. Error*	*Beta*		
1	(Constant)	.553	.384		1.438	.153
	EE_M	.042	.090	.037	.468	.640
	PE_M	.442	.089	.444	4.945	.000
	SI_M	.112	.095	.114	1.183	.239
	FC_M	.130	.111	.104	1.174	.242
	HM_M	.164	.090	.134	1.831	.069
	PV_M	.013	.090	.011	.150	.881
	HT_M	.005	.104	.004	.048	.962

a. Dependent Variable: BI_M

6 Conclusion and recommendations

Results showed that students had variations in their perceptions of virtual reality technology. The results showed that participants had positive perceptions of the pleasant experiences associated with virtual reality represented in their responses to the hedonic motivation sub-scale. In addition, the students positively perceived virtual reality's ease of use. However, the students had close to neutral perceptions of effort expectancy, social influence, facilitating conditions, price value, and habits concerning the use of virtual reality. Such results indicated that the students were not regular users of virtual reality.

Furthermore, the results showed that the students positively intended to use virtual reality for educational purposes. Part of students' positive behavioral intention to use virtual reality for educational purposes can be ascribed to their perceptions of effort expectancy, performance expectancy, social influence, hedonic motivation, price value, facilitating conditions, and habits concerning the use of virtual reality. Students' perceptions of performance expectancy concerning virtual reality had the greatest effect on their behavioral intention to use virtual reality for educational purposes. The research advances our understanding of how to apply the UTAUT2 to analyze how Jordanian students utilize virtual reality for personal and academic purposes, as the UTAUT2 was useful for illuminating why students accepted virtual reality for personal and academic purposes. The empirical results of this study should direct practitioners in higher education who want to increase the use of technology in education, specifically virtual reality technology. To increase students' use of virtual reality and benefit from the evident advantages of virtual reality, stakeholders should pay close attention to show the students the usefulness of virtual reality, to provide students with proper training on how to use virtual reality, to provide students with the required resources to use virtual reality, to enhance the reputation virtual reality as a useful educational tool among society, to make the cost of virtual reality affordable for students, to make the use of virtual reality enjoyable, and to make the use of virtual reality habit among students. Future studies can be conducted to examine other factors that might affect students' behavioral intention to use and actual use of virtual reality. In addition, future studies can be conducted using different research methods, e.g., qualitative, and mixed methods, to investigate information technology students' experience with virtual reality. Furthermore, Future studies can be conducted to investigate administrators' and instructors' perspectives on the use of virtual reality for educational purposes.

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