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THE CRITICAL FACTORS OF COLLEGE STUDENTS' INTENTION TO USE METAVERSE TECHNOLOGY FOR SUBJECTS RELATED TO IMPORT-EXPORT LEARNING

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Abstract

New Virtual reality (VR) products have exploded due to corporate and academic interest in VR technology. Young people are also interested in logistics careers. Modern import/export courses are realistic but mostly hypothetical. Metaverses are used in education, especially logistics training, but little is known about why. To close this gap in logistics training, we linked import-export training courses with metaverse technology, addressed ways to teach it in virtual reality, and studied what motivates college students to participate in metaverses. Metaverse technology can help international students understand port forwarding by connecting them. These connections let international students learn about each other's import and export businesses. UTAUT inspired a new research paradigm and quantitative studies to test its hypotheses. Metaverse technology users for import-export learning were characterized by 413 representative college students. Conducive environments, hedonic motivation, and trust improve students' usage behavior, according to the survey. Access to resources and tools, pleasurable interactions with technology, and trust in the information provided and privacy and security over personal data are all facilitating conditions. These findings shed light on students' intentions to use metaverse for import-export learning, which can be used to improve programs and systems.

Keywords: *Import/export courses, Metaverse, UTAUT, Virtual space*

1. Introduction

The rapid advancement of digital technology and the global impact of the COVID-19 pandemic have transformed society into a faceless and interconnected world. Cultural transmission has been facilitated through digital means, enabling communication and learning across time and space (Joo et al., 2021). As a result of the pandemic, online learning has gained significant popularity, as it offers a viable alternative for both students and teachers (Safsouf et al., 2020). Notably, the Politecnico di Torino in Italy suspended in-person lessons during the pandemic and successfully transitioned to offering a staggering number of virtual courses, accommodating thousands of participants (Kumar & Al-Besher, 2022). In the realm of education, Virtual Reality (VR) and Augmented Reality (AR) technologies have shown promise in enhancing students' learning experiences. Specifically, in the context of natural science education, these immersive technologies have been found to improve learning efficiency, increase attentiveness, and cater to students' interests (Alnagrat et al., 2022). The practicality, flexibility in scheduling, accessibility to up-to-date resources, and ability to facilitate students' maximum potential are among the reasons for the growing popularity of e-learning.

Metaverse technology has attracted considerable attention from experts and educators, as it presents new possibilities for online learning (Dwivedi et al., 2022). Unlike traditional software that relies on learning management systems and pre-designed classes, metaverse platforms enable students to interact within virtual worlds and engage in collaborative learning experiences. These platforms incorporate gamification and other strategies to make learning enjoyable and personalized, catering to the diverse needs of students. The surge in interest from both the business and academic sectors has resulted in the introduction of numerous new VR devices to the market (Ning et al., 2021). Logistics has emerged as an increasingly appealing field for the younger generation, and current import-export courses tend to focus on theoretical content rather than practical application. To address this gap, our study utilizes metaverse technology to teach import-export in a virtual reality setting, aiming to provide a more realistic and immersive learning experience. By leveraging metaverse technology, students can simulate various import-related tasks such as completing paperwork and navigating customs clearance processes. Additionally, the technology allows for the creation of three-dimensional representations of vehicles, cargo ships, and other import-export equipment, further enhancing the authenticity of the training.

The UTAUT (Unified Theory of Acceptance and Use of Technology) paradigm is frequently used to study how people decide to use technology. Numerous studies have examined the adoption of various technologies, including virtual and augmented reality (Alvarez-Risco et al., 2022; Jafar et al., 2023). The UTAUT model examines performance expectancy, effort expectancy, social influence, and facilitating conditions to determine technological uptake (Pal et al., 2021; Venkatesh et al., 2003). Educators and designers can improve technology acceptance and learning by recognizing the key elements that influence college students' metaverse technology use (Akour et al., 2022). This study addresses several research gaps in the field of metaverse technology and import-export education. Firstly, while metaverse technology has been extensively studied, its application in the context of import-export learning remains understudied. By investigating the use of metaverse technology for import-export education, this research fills this gap and provides valuable insights into its potential and impact. Additionally, the study expands upon the Unified Theory of Acceptance and Use of Technology (UTAUT) framework by incorporating hedonic motivation and trust factors specific to metaverse technology use in import-export learning as shown in Fig. 1. Furthermore, the role of facilitating conditions in metaverse technology adoption and the impact of social influence on college students' desire to use metaverse technology for import-export education are explored. The study also justifies the use of the UTAUT model, given its theoretical foundation and widespread adoption, and investigates the influence of trust on import-export courses in metaverse (IEM) learning behavior. Finally, the potential of metaverse technology in enhancing interactive virtual reality education is examined, aiming to contribute to the understanding of its effectiveness in the import-export domain and other areas of technical education.

2. Hypotheses and Conceptual framework

2.1. Performance expectancy

Performance expectation (PFE) refers to individuals' belief in the system's utility and their perception of how well they can use technology to complete tasks effectively (Venkatesh et al., 2003). Previous research has consistently highlighted the significant impact of PFE on individuals' behavioral intention to adopt and utilize information technology systems (Chavoshi & Hamidi, 2019). Studies have shown that high performance expectations positively influence the adoption of various technologies, such as mobile learning (Chavoshi & Hamidi, 2019) and internet banking (Tarhini et al., 2016), as they enhance individuals' expectations of achieving academic success or improving their banking experiences. Therefore, in the context of metaverse technology for import-export courses, if students perceive that the metaverse

can enhance their knowledge and skills in import-export, they are more likely to have a positive perception of the technology and engage with it actively. Thus, we hypothesize that:

H1. PEE has a positive influence on students' behavior intention to attend IEM

2.2. Effort Expectancy

Effort expectancy (EFE) refers to the perception of easiness associated with using an online information system or advanced technologies (Venkatesh et al., 2003), such as mobile learning, mobile commerce, and metaverse. It captures users' perceived ease of use when interacting with these technologies. Previous research has consistently demonstrated the significant influence of EFE on individuals' adoption of various technology-based services (Dwivedi et al., 2019). In the context of mobile learning, EFE has been identified as the most influential factor affecting students' adoption of mobile learning services (Chavoshi & Hamidi, 2019). When it comes to metaverse-embedded courses, a positive EFE can contribute to students' clarity and understanding, preventing confusion and facilitating the learning process. For the above reasons, we hypothesize:

H2. EFE has a positive influence on students' behavior intention to attend IEM

2.3. Social influence

Social influence (SI), as described by Venkatesh et al. (2003), refers to the extent to which an individual believes that others around them genuinely think they should adopt a new technological innovation. In other words, it encompasses the social pressure exerted on an individual due to the opinions and beliefs of others or organizations. These factors are based on the assumption that an individual's behavioral intention is heavily influenced by their perceived notion of how others perceive the innovation. In the context of technology adoption in education, social influence plays a critical role in encouraging learners to adopt new technologies (Andrews et al., 2021). Previous research has consistently highlighted the significance of SI in shaping users' behavioral intentions toward technology adoption (Dečman, 2015), including in domains such as mobile learning, mobile government service adoption, and e-government service usage (Venkatesh et al., 2011; Wong et al., 2015). Thus, we hypothesized that:

H3. SCI has a positive influence on students' behavior intention to attend IEM

2.4. Facilitating conditions

A facilitating condition (FCC) is a person's conviction that the use of a new system or technology may be facilitated by organizational and technical resource (Venkatesh et al., 2003). This is transferred to the use of metaverse technology for subjects related to import-export learning environments, such as access to wireless networks, provision of mobile devices, and technical assistance when needed. Theorized and proven to have a favorable influence on use behavior were FCC (Magsamen-Conrad et al., 2015). As a result, the following possibilities were offered:

H4. FCC has a positive influence on students' behavior intention to attend IEM.

2.5. Hedonic motivation

Hedonic motivation (HDM) refers to the pleasurable sensations and enjoyment that individuals experience when using a new technology (Venkatesh et al., 2003). Marketers are encouraged to design advertisements in a more innovative and creative manner to enhance their effectiveness and interaction with consumers, thereby fostering their hedonic motivation (Nguyen et al., 2022). In the realm of technology, apps and learning program incorporating augmented reality are more likely to provide users with a positive user experience compared to chatbots (Akour et al., 2022). Ultimately, individuals' purposeful behavior in

effectively utilizing new technology is influenced by their hedonic motivation (Nguyen et al., 2022). Thus, in the context of educational uses of metaverse technology, we hypothesized that:

H5. HDM has a positive influence on students' behavior intention to attend IEM.

2.6. Trust

Trust (TRT) has been identified in previous research as a significant factor that can influence individuals' behavior when using technology (Liébana-Cabanillas et al., 2020). The concept of trust encompasses both individual and societal aspects. The modified commitment-trust theory suggests that trust has both an indirect impact on behavior through its influence on commitment, as well as a direct impact on behavior (Shin & Hwang, 2020). Trust plays a crucial role in promoting behavioral intention. In the context of using metaverse technology for import-export learning, if college students believe that the metaverse platform will facilitate their learning of import-export material, they are more likely to use it and actively engage in learning activities. This underscores the importance of perceived trust in fostering behavioral intention, leading to the formulation of next hypothesis:

H6. Trust has a positive influence on students' behavior intention to attend IEM

2.7. Behavioural intention

Behavioral Intention (BHI) is a key factor in understanding the actual use behavior of technological system and services as highlighted by previous studies (Magsamen-Conrad et al., 2015). The intention to adopt technology is often driven by the perceived utility and usability of the system (Wong et al., 2015). Furthermore, the positive mood induced by the e-learning system can significantly influence students' behavior (Shen et al., 2022), while social factors play a role in shaping students' intentions to engage in mobile learning (Yuan et al., 2021). In light of these findings, this study posits next hypothesis, suggesting that college students who utilize the metaverse for import-export learning will benefit from enhanced behavioral intention.

H7: Behavioral intention of students in using IEM has a positive influence on their use behavior (USB)

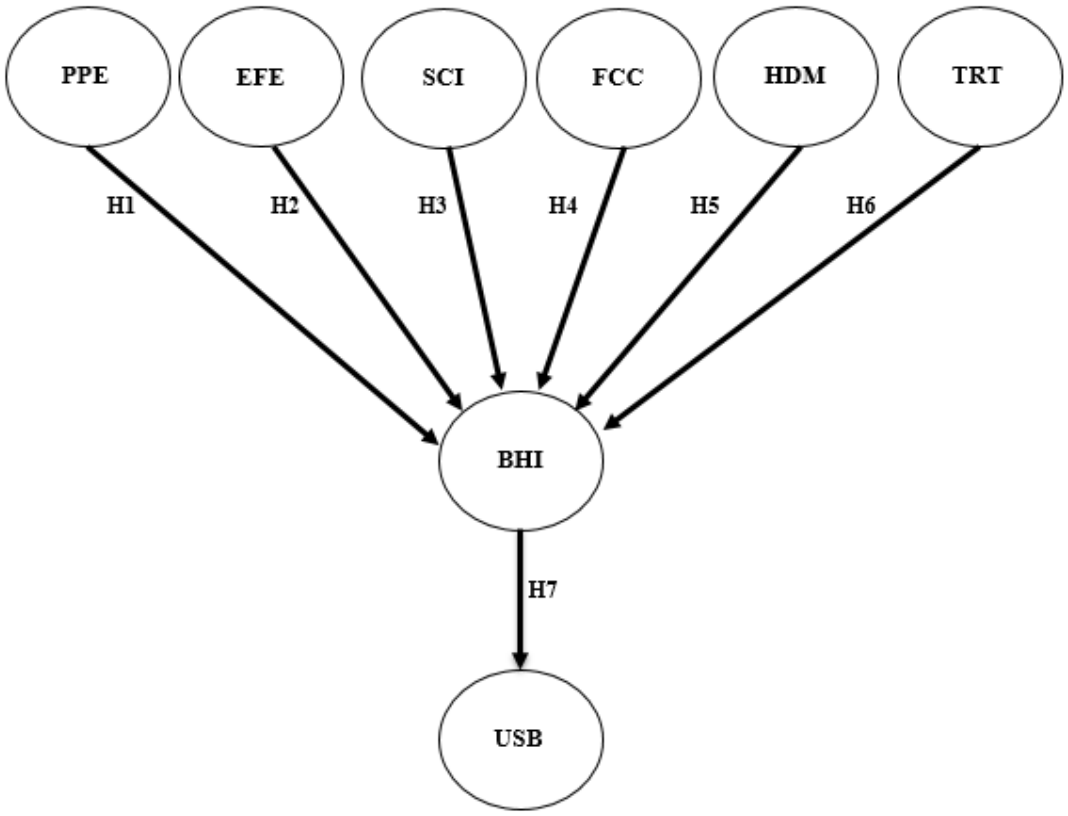

Fig. 1. Conceptual framework

3. Research methodology

This study focuses on examining the motivations of college students in Ho Chi Minh City to utilize metaverse technology for studying import/export issues. Structural equation modeling was employed to analyze the relationships among different variables. To enhance the questionnaire, a video was included that explains the concept of the metaverse, showcases existing educational materials in the metaverse, and presents potential applications of metaverse technology for import/export studies. Juniors and seniors were specifically targeted as participants due to their maturity and broader knowledge, which enables them to better assess the usefulness of emerging technologies. Given the increasing prevalence of online distance learning in the aftermath of the COVID-19 pandemic, college students have been exposed to various innovative tools, making them a suitable population for this research. Purposeful sampling was utilized to ensure the selection of participants who could provide valuable insights. The questionnaire was administered and collected at each stage, with a demographic survey form serving as the data collection instrument, using a seven-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (7) to rate the components of the measure. To ensure an adequate sample size for the analysis using partial least squares-structural equation modeling (PLS-SEM), the "10 times rule" suggested by Christopher Westland (2010) was applied. According to this rule, a minimum of 131 responses was determined as the required sample size. Additionally, G*Power version 4 was utilized to calculate the smallest sample size considering parameters such as a statistical power of 0.8, margin of error of 0.05, effect size of 0.15, and six predictors. The results indicated that a sample size of 98 would be sufficient. It is important to note that the term "minimum" in this context refers to the smallest practical sample size with a specified level of significance and power for SEMs (Duarte & Raposo, 2010). However, it is generally recommended to have larger

sample sizes as they more accurately represent the characteristics of the target populations. Therefore, when conducting PLS-SEM analysis, researchers should aim for a sample size larger than the minimum requirement. The measurement items for PEE, EFE, SCI, FCC, BHI adapted from Venkatesh et al. (2012), HDM adapted from Nguyen et al. (2022), and TRT, USB adapted from Chong (2013). The majority of respondents in the study were female, accounting for 60% of the total respondents, while males accounted for the remaining 40%. The survey primarily targeted students, with 85% of respondents and 15% is instructors and lecturers. In terms of ability of using technology, the majority of respondents (78%) is tech-savvy, while the remaining 22% has reluctant to experience new technology. Regarding the willingness of using metaverse in studying, 80% of respondents wants to study in metaverse. Only 20% of respondents ignores the use.

4. Data analysis and discussion

4.1 Assesing measurement model

The measuring model for a reflective model requires reliability and validity. Cronbach'salpha and composite reliability (CR) measure reliability, while convergent validity and discriminant validity measure validity (J. F. Hair et al., 2014). "The degree to which two or more efforts to measure the construct are consistent with one another" is convergent validity, which may be proven "by assessing both the average variance extracted (AVE) and indicator loadings" (J. Hair et al., 2017). "The extent to which the construct is empirically distinct from other constructs, or, in other words, the construct measures what it is intended to measure" (Hair et al., 2014) is the discriminant validity, which is established when "the square root of the AVE for each construct is greater than the correlations between that construct and all other constructs" (Ab Hamid et al., 2017) in table 2. General rules for Cronbach's alpha, CR, AVE, and indicator loading:

- Cronbach's alpha must be larger than 0.70. (Nunnally & Bernstein, 1995)
- The CR should be at least 0.60. (Bagozzi & Yi, 1988)
- AVE should be more than 0.50. (Kline, 1988)
- Indicator loading is 0.70 or higher (Claes Fornell & David F. Larcker, 1981)

Table 1 shows that CR and Cronbach's alpha values exceed the rules of thumb, validating all constructs. Excellent indicator loadings and AVE ensure convergent validity. Table 2 reveals this study has discriminant validity.

Table 1: Indicator loadings, AVE, CR of constructs

Construct	Items	Loading	AVE	CR	Cronbach's a
BHI	BHI1	0.938	0.882	0.957	0.933
	BHI2	0.942			
	BHI3	0.938			
EFE	EFE1	0.905	0.803	0.942	0.918
	EFE2	0.911			
	EFE3	0.897			
	EFE4	0.870			
FCC	FCC1	0.850	0.738	0.919	0.882
	FCC2	0.836			
	FCC3	0.897			
	FCC4	0.853			
HDM	HDM1	0.848	0.747	0.899	0.831
	HDM2	0.875			
	HDM3	0.870			
PFE	PFE1	0.890	0.803	0.925	0.878
	PFE2	0.894			
	PFE3	0.905			
SCI	SCI1	0.891	0.802	0.924	0.877
	SCI2	0.917			
	SCI3	0.879			
TRT	TRT1	0.734	0.598	0.816	0.719
	TRT2	0.703			
	TRT3	0.873			
USB	USB1	0.864	0.586	0.808	0.725
	USB2	0.743			
	USB3	0.678			

Table 2: Discriminant validity test

	BHI	EFE	FCC	HDM	PFE	SCI	TRT	USB
BHI	**0.939**							
EFE	0.366	**0.896**						
FCC	0.348	0.672	**0.859**					
HDM	0.397	0.692	0.764	**0.864**				
PFE	0.342	0.574	0.603	0.610	**0.896**			
SCI	0.390	0.586	0.709	0.663	0.776	**0.896**		
TRT	0.769	0.566	0.611	0.677	0.536	0.607	**0.774**	
USB	0.791	0.544	0.480	0.500	0.491	0.551	0.718	**0.765**

4.2 Inspecting Structural Model

The inner structural model was examined using a p-value of 0.05 or less as the significance threshold. Table 3 reveals that, with the exception of H1, H2, H3, all other hypotheses were supported. FCC (β = -0.112, $p<0.05$), HDM (β = -0.168, $p<0.05$), and TRT (β=0983, $P<0.05$) are substantially related to the Behavioral Intention of the student using metaverse technology for subjects related to import-export learning. Furthermore, BHI (β= 0.791, $p<0.05$) shows a strong relationship with USB. In contrast, the constructs PFE (β = -0.042, $p > 0.05$), EFE (β = 0.031, $p> 0.05$), and SCI (β = 0.000, $p > 0.05$) were not

supported by the BHI to assess the use behavior of students. Overall, PFE and TRT account for 61.8% of the changes in BHI, whereas BHI accounts for 62.5% of the changes in USB.

Table 3: Results of hypotheses testing

Hypotheses	Path	Original sample (O)	T statistics (|O/STDEV|)	P values	Remarks
H1	PFE -> BHI	-0.008	0.161	0.8720	Not Supported
H2	EFE -> BHI	0.031	0.735	0.4620	Not Supported
H3	SCI -> BHI	0.000	0.004	0.9970	Not Supported
H4	FCC -> BHI	-0.112	1.979	0.0480	Supported
H5	HDM -> BHI	-0.168	3.249	0.0010	Supported
H6	TRT -> BHI	0.938	21.247	0.0000	Supported
H7	BHI -> USB	0.791	58.064	0.0000	Supported

4.3 Discussion

The rapid development of technology suggests that the metaverse will play a significant role in future education. Therefore, the primary objective of this study was to identify the key factors influencing college students' willingness to adopt metaverse technology for import-export learning. Given the widespread use of the metaverse in online education, improving its educational capabilities is crucial for its success in the present context. In conjunction with the Unified Theory of Acceptance and Use of Technology (UTAUT), this study aimed to uncover the factors influencing students' intention to use metaverse technology for subjects related to international trade and offer recommendations for future advancements in metaverse technology in logistics education.

The findings revealed that facilitating conditions, hedonic motivation, and trust have a positive influence on students' behavioral intentions. When students have access to necessary resources and materials, such as high-speed internet, mobile devices, desktop computers, and laptops, their confidence in the usefulness of metaverse technology increases, thereby enhancing their intention to use it for import-export learning. Additionally, if students find the use of metaverse technology for studying import-export engaging and enjoyable, their hedonic motivation is amplified, fostering their curiosity and promoting continued usage of the technology in their educational pursuits. Positive user experiences with the technology contribute to increased future adoption. Furthermore, over 80% of students express readiness and enthusiasm to utilize metaverse technology for studying import-export subjects. Additionally, trust in the reliability and accuracy of the technology and the data it provides plays a crucial role in students' willingness to use it for import-export learning. Factors influencing trust include privacy and security concerns, the reliability of the information provided, and the perceived dependability of the underlying technology. Trust serves as a foundation for fostering positive attitudes and intentions towards using metaverse technology.

On the other hand, H1 is not supported, indicating that students may not fully grasp the potential of interactive and immersive features offered by metaverse technology to enhance their understanding of import-export concepts. This suggests a need for greater awareness and education about the potential benefits of metaverse technology in import-export learning. Similarly, H2 is not supported, indicating that the impact of effort expectancy on students' behavior is relatively lower. This could be attributed to the unfamiliarity of students with metaverse technology, as it is a relatively new concept, leading to underestimation of their ability to use and navigate it. Lastly, H3 is not supported, possibly due to the limited mention and application of metaverse technology in international education. The potential of the

metaverse for import-export learning might not have been fully realized, and personal preferences may have a stronger influence on individuals than social pressure. Utilizing the full potential of metaverse technology for import-export education requires demonstrating its benefits and practicality.

5. Conclusion and contributions

In term of theoretical contributions, this study contributes to the existing literature by examining the factors influencing college students' willingness to adopt metaverse technology for import-export learning. It expands the understanding of technology adoption in the educational context, specifically in the emerging field of the metaverse. Secondly, the study also integrates the Unified Theory of Acceptance and Use of Technology (UTAUT) framework into the context of metaverse technology adoption, providing empirical evidence on the applicability of this theory in the educational domain. Thirdly, by examining the role of facilitating conditions, hedonic motivation, and trust, the study sheds light on the specific factors that influence students' behavioral intentions to use metaverse technology for import-export learning. This adds to the knowledge base of the factors driving technology adoption in the educational context. Finally, the study challenges and expands upon previous research by investigating the impact of effort expectancy, which was found to have a relatively lower influence on behavior compared to other factors. This highlights the unique characteristics and challenges associated with adopting metaverse technology in the field of import-export education.

In term of managerial implications, the findings of this study provide valuable insights for educational institutions and policymakers regarding the adoption and integration of metaverse technology in import-export education. It emphasizes the importance of providing necessary resources and materials to students, such as high-speed internet and devices, to enhance their engagement and intention to use metaverse technology.

Moreover, the study underscores the significance of creating an engaging and enjoyable learning experience through metaverse technology. Educational institutions can leverage the immersive and interactive features of the metaverse to enhance student motivation and interest in import-export subjects, ultimately improving learning outcomes. Addotionally, trust emerges as a crucial factor in students' willingness to use metaverse technology. Managers and policymakers should prioritize establishing trust in the reliability, security, and privacy aspects of the technology. Transparent communication and robust data protection measures can help build trust among students and encourage their adoption of metaverse technology for import-export learning.

The study's insights into the underutilization of metaverse technology in international education highlight the need for awareness campaigns and educational initiatives to familiarize students and educators with the potential benefits and applications of the metaverse in import-export education. Managers and policymakers can work towards integrating metaverse technology into the curriculum and providing training opportunities to enhance its adoption.

Metaverse technology lets students safely study global trade and logistics before applying their knowledge. This may increase training and prepare students for worldwide trade. Metaverse technology saves schools money. Virtual simulations and field excursions save schools money and time. Metaverse technology enables students to interact on projects and simulations. This activity can improve import-export teamwork and communication. Educators and developers should provide engaging, easy-to-use metaverse learning tools to facilitate import-export learning. These critical issues may enable educators and developers to encourage higher education students to research import-export themes using metaverse technology.

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