From Crisis to Digital Competence: Investigating the Impact of Self-Efficacy on Perceived Technology Use through the Technology Acceptance Model in Undergraduate Business Education

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Abstract

The visible global fast expansion of Coronavirus outbreak has deeply affected education, speeding up the shift toward digital learning and technology. Universities are now operating in a post-pandemic world with hybrid teaching and AI-based platforms. Understanding what motivates students to accept technology is more important than ever. The main aim of the present study is to investigate the connection involving undergraduate business higher education students' self-efficacy (SE) and their perceived value of how beneficial technology is (usefulness) through the application of TAM (Technology Acceptance Model). Students' gender, self-efficacy, and fundamental TAM components were among the thirty-six questions included in a validated survey that collected data. Undergraduates with familiarity with various forms of interactive learning technology served as the focus groups of this research study. The outcomes of the study indicate that students' beliefs in their own abilities have a major impact on how they rate the practicality and simplicity of Edu-tech (educational technology) and AI-enhanced learning tools. Results show a favourable correlation between self-efficacy and three measures of technology adoption intent: behavioural intention (BI), perceived ease of use (PEOU), and perceived usefulness (PU). Educational policymakers and practitioners can benefit from these insights, which underscore the need for initiatives that build digital confidence and skills for lasting academic and career success.

A new viewpoint is offered by this current study, which expands upon TAM (Technology Acceptance Model), considering the changes in education following Coronavirus. It highlights how self-efficacy contributes as a key determinant of technology acceptance in undergraduate business education.

***Keywords**: Coronavirus, Electronic LEARNING, e-learning, AI, Educational Technology, Edu-Tech, Self-Efficacy (SE), Technology Acceptance Model (TAM).*

Introduction

Without a doubt, the higher education sector was clearly affected by the coronavirus epidemic regarding students' learning and education planning. Nevertheless, institutions quickly adjusted to new tactics and approaches leveraging technology and e-learning. Although many university stakeholders believe that technology generally has a positive impact on their campuses, they also recognize several difficulties. Through a single, standardized online interface set up within universities, the e-learning education system offers services that are crucial components for addressing course requirements. E-learning supports educators with a variety of tools that facilitate managing course materials, enabling communication with students in real-time

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or at their convenience, organizing peer evaluation, managing curriculum logistics, issuing grades, and utilizing online platforms for tests, surveys, and projects. Additionally, it allows educators to monitor students' progress, review submitted work and reports, manage tasks, and foster open discussions within a controlled digital setting (Akpen, Asaolu, Atobatele, Okagbue, & Sampson, 2024). The emergence of Web 3.0 technologies has boosted the capabilities of e-learning platforms, enabling educational institutions to offer services that facilitate a smooth transition from transition from just mindful to a more engaged learning. These tools enable students to participate more meaningfully and interactively in the online learning environment (Massy, 2005).

According to previous studies, corporate enterprises, universities, and educational institutions use electronic means on learning besides technologies to provide their employees with cost-effective online training (Sharma & Rathore, 2022) (Alnemrat, Aldamen, Al-Deaibes, & Alsharefeen, 2023). Academic institutions are adopting e-learning systems with significant financial and material investments. Unless users are able to utilize these technologies and learners gain value from them, their full potential will not be realized (Alyoussef, 2023).

This study aims primarily to examine insights and perceptions of learners along sight with heir and experiences with electronic learning and digital education during and after the Coronavirus epidemic. The structure of the study is: Section two a conceptual framework which concentrates on electronic learning and (TAM) the Technology Acceptance Model (TAM) Third section illustrates the employed research methodology. Section Four presents the findings of the data analysis. The fifth and section presents the study's conclusions, encompassing important implications, limitations, along with recommendations for further research.

Importance of the Study

The significance of this study lies in its expansion on TAM while considering SE as an important psychological factor that impacts how undergraduate business students use technology in education. While TAM has been generally considered and applied to look at the technology integration in education, this study provides a novel perspective by examining the moderating effect of SE on the core TAM constructs: PU (Perceived Usefulness), PEOU (Perceived Ease of Use) and BI (Behavioural Intention) in a post pandemic and AI-enhanced learning setting. Moreover, this study delves deeper into expanding TAM through joining perceived enjoyment (PE), perceived cyber risk (PCR), and personal innovativeness in IT (PIIT) while the main focus remains on the predictive power of SE- a variable that is often overlooked in comparable farmwork.

Study Problem

Despite the fast implementation of educational technology since Coronavirus epidemic, challenges have been faced by higher education institutions in reaching strong interactive engagement with the technological platform by students. Regardless of the resources allocated to support this implementation, success relies on more than just their availability but also on how effectively the students accept and incorporate them into their individual learning. The level of incorporation is contingent upon students' self-efficacy in utilizing technology. The influence of self-efficacy on the perceptions of utility and ease-of-use of technology has not been thoroughly reviewed and examined especially among undergraduate business students.

This gap limits many institutions from succeeding in developing and integrating solutions that ensure sustained utilization of Edu-Tech (Tajuddin, 2025) (Lukina, et al., 2022).

Study Objectives

- To investigate the extent to which Self-Efficacy of undergraduate business students alter the level of ease and usefulness is of technology integration in the educational setting.
- To examine how Self-Efficacy will impact their behavioral willingness and intention to embrace e-learning platforms.

- To assist institutions in their path to improving their technological literacy and readiness to incorporate new up-to-date technologies via providing useful insights.

This study employs a mixed-methods approach, drawing its findings from the educational context of Egyptian private universities where technology proficiency varies from one other. It draws the attention on the power of strengthening students' SE as an enabler toward electronic learning implementation. In the Egyptian context, this study adds to the current literatures by shedding the light on the power of fortifying students' SE toward technology as a main driver for successful electronic learning implementation. The insights from this study emphasize that technology SE is important to integrate digital learning foundation in higher education.

Study Hypothesis

- H1: There is a significant positive relationship between SE and PU
- H2: There is a significant relationship between SE and PEOU
- H3: There is a significant relationship between SE and BI
- H4: PU moderate the relationship between SE and BI
- H5: PEOU moderate the relationship between SE and BI

H1: Self-efficacy (SE) exerts a significant positive influence on Perceived Usefulness (PU).

The main founder of the self -efficacy Bandura (1997), on the individuals' principle, which focuses on the believes of individuals in their own abilities to perform tasks successfully (Nassani, Alkhulaifi, Alı muhawis, & Alnujaidi, 2023). While the context of TAM from Davis's perspective (1989) highlighted the capability of individuals, which reflect on their perspective of the usefulness of technology. It is basically around three main assumptions, the first is that regardless how the person feels at first about technology he will eventually see how useful it is and accept it, the second is that the person's behaviour toward using a specific technology is affected on how it is easy to use accordingly seen as helpful. Third, the essence oof TAM model is to be applied across different systems and contexts (Davis, 1989).

H2: Self-efficacy (SE) exerts a significant positive influence on Perceived Ease of Use (PEOU).

According of Compeau and Higgins research findings indicating that individuals who have high SE with regard to computers, experience less stress and hand technological system in a simpler way (Compeau & Higgins, 1995). Moreover, *in line with* Venkatesh and others' Unified Acceptance and Use of Technology (UTAUT) people who feel more assured expect exerting lesser amount of effort when operating a system (Venkatesh, Morris, Davis, & Davis, 2003). Furthermore, Sweller with his Cognitive Load Theory showed that when a person senses he has a high ability, he experiences lower mental effort which reflects on perceiving the work as easy (Sweller, 1988).

H3: Self-efficacy (SE) has a significant positive effect on Behavioral Intention (BI).

This link was implied in Deci and Ryan's Self-Determination theory, where they insured that when people believe in their abilities and in charge they tend to go forward and act (Deci & Ryan, 2000), accordingly it will be toward the usage of technology in similar situations. While the theory of Planned Behavior by indicated that people are motivated to fulfill a task when they believe in their abilities. Which eventually supports the idea of a positive link between SE and BE (Ajzen, 1991).

H4: Perceived Usefulness (PU) moderates the relationship between Self-efficacy (SE) and Behavioral Intention (BI).

The Triandis' in his theory of Interpersonal Behavior (TIB) conceptually justifies this relationship. As he emphasizes that for an intention to be strong a combination of belief (i.e. PU) and capabilities (i.e. SE) must be aligned (Triandis, 1979).

H5: Perceived Ease of Use (PEOU) moderates the relationship between Self-efficacy (SE) and Behavioral Intention (BI).

People are inclined toward the usage of technology whenever they feel optimistic about it (SE), a concept built on TAF, Task-Technology Fit theory by Goodhue & Thompson (1995) which suggests that tools are considered more effective when they are easy to use and compatible with the user's abilities (Goodhue & Thompson, 1995). Also, CAT, Lazarus and Folkman's Cognitive Appraisal Theory that illustrates individuals are more into acting when they feel assured and perceives the job as doable (Lazarus & Folkman, 1984). So, the degree to which SE affects one's intent to use a system can be either increased or decreased by PEOU (King & He, 2006).

Literature Review

Educational Technology Platforms

The significance of adopting online educational strategies by educational institutions to create and deliver efficient online courses has been shown in several e-learning strategies examined in developing nations. According to Mahmood (Mahmood, 2020), educational institutions must collaborate with telecom businesses, solicit student input, and offer flexible teaching and evaluation methods.

In their study on emerging technologies in HE, Sembey and colleagues emphasized the huge impact that novel technologies such as Extended-Reality software solutions have on the future of education, particularly in relation to the rise of student engagement. (Sembey, Hoda, & Grundy, 2024).

According to Frăsineanu & Ilie, e-learning enhances educational practices in a virtualized environment by combining digital tools with traditional educational approaches (Ilie & Frăsineanu, 2019). Additionally, both structured and unstructured learning will benefit (Mousa, Aldeen, Nasir, & Hamdi, 2020). S. Marini & M. Milawati highlighted in their study that Coronavirus along with the rise of Education 4.0, sped up the transition to digital learning in Indonesian schools. Education 4.0 aims to endorse public benefit through a special focus on the usage of creative solutions, digital tools, e-learning, and accessible resources. (Marini & Milawati, 2020).

Technology Acceptance Model (TAM)

Education has evolved in the past twenty years, since digital technology has been utilized in teaching, learning and evaluation (Dwivedi, et al., 2022). Asynchronous learning is made possible by hybrid learning systems like the Moodle or e-Learning platforms, whereas synchronous learning is made possible by virtual meeting platforms, such as Zoom, by removing physical obstacles. These innovations have transformed the way that teachers and students learn, providing educational institutions with additional financial alternatives, and opening the door for innovative educational platforms powered by artificial intelligence (Kabudi, Pappas, & Olsen, 2021).

Many models were suggested by professional researchers throughout previous years to examine how much people depend on the information systems within the context of the embrace of technology. Among those, TAM is the most noteworthy, developed by Davis in 1989 (Davis, 1989), and further development were introduced in 2020, by Zaineldeen, Hongbo, and Hassan (Zaineldeen, Hongbo, & Hassan, 2020). TAM places the foundation for recognizing the motives underlying people's embrace of advanced technology. Through revealing views and prediction abilities, scholars and practitioners are more able to evaluate the appealing characteristics of a certain technology (Lai, 2017) . As Taherdoost highlighted in 2018, important components of TAM include how people view the beneficial outcome from technology advancements, how easy it is to use, and their attitude toward adopting it (Taherdoost, 2018). Primarily developed by Davis in 1989, TAM offers a strong and well-grounded structure for explaining and antici-

pating people' behavioural intents regarding the embrace of emerging technological innovations. There are two main viewpoint that were considered in this model, the PEOU- build on the belief that operating on a system would require only reduced effort- and PU-the idea that technology and its updates will make the execution of work better and improved, with these two in mind it has been highlighted there effect the person's BI toward the utilization and adoption of technologies which help in expecting the real utilization (Zobeidi, Homayoon, Yazdanpanah, Komendantova & Warner, 2023). Selecting TAM to be examined is a decision supported by its solid conceptual framework alongside with the experimental studies huge in number that encourage its utilization. This is with special consideration of the research studies that investigated TAM withing the Edu-tech environments. This current research study builds on TAM to investigate intrinsic motivation such as PE-Perceived Enjoyment, and possible obstacle such as PCR-perceived cyber risk as factors that determine the people's willingness to adoption electronic learning platforms. To add more to this the integration of persons' characteristics such as PIIT- personal innovativeness in IT and SE noticeably affected the PU and PEOU. With this, it is concluded that the level of a person's satisfaction and enjoyment encountered while using a technological platform is reflected by PE (Al-Adwan A. , et al., 2023).

Researchers highlighted the visible impact of perceived utility, straightforwardness, and EOU-ease of use on people performance and behaviour. Accordingly, TAM examines the emotional impact of people regarding recognizing the necessity of technology adoption based on PU and Perceived usability (Zaineldeen, Hongbo, & Hassan, 2020). Lazim built his study in 2021 on the integration of electronic learning within the academic environment of Malaysia's University Tunku Abdul Rahman's students. Resulting to the importance of considering motivation and a key factor to encourage undergraduate students to embrace up-to-date technologies in their learning environment. Furthermore, the students' encouragement toward the adoption of these technologies was shown to be highly impacted by PEOU and perceived utility (Mousa, Aldeen, Nasir, & Hamdi, 2020).

While the educators and academic staff level of willingness to integrate the up-to-date Edu-tech to support the hybrid learning environment have been investigated by using TAM. With the participation of 375 academic staff and students in 4 different public and private higher education institutions, resulting a high demonstration of their willingness to embrace these Edu-tech in different circumstances even the challenging ones such as availability of adequate number of computers, supporting applications and professional applications along with a sustained internet connection (Shaaban & Rabie, 2022). While TAM was utilized among academics and researchers in University of Jordan for the purpose of examining the students' intent to benefit from their personal smartphones and devices in embracing Edu-tech during their study. Researchers added in the model as well mobile-learning SE, the students' interaction purpose, perceived utility, PEOU, personal norms, the accessibility of the program(s) and their feeling and approach concerning this adoption. The findings were reached with the participation of 1199 undergraduate students who confirmed that the added TAM variables have had a visible impact on the behavioural intention to interact digitally through Edu-tech apps on their personal smart devices (Falah, et al., 2020).

Also, a research study overseen in the United Arab Emirates (UAE) adopting TAM with the purpose of examining the degree of acceptance of the online electronic Google Translate (GT) system. It was concluded in the study that people's purpose to act to depend on GT in their work was highly inspired by encouragements, PEOU, PU. While the existence of different types of encouragement and the PU had a role in modeling PEOU (Shaaban & Rabie, 2022). Moreover, in their study at Cyprus International University, Vanduhe and colleagues were supported by the use TAM and focused on evaluating the educators' degree of acceptance and integration of advanced Edu-tech tools such as gamification as an interactive part of their lectures, resulting in more students-professors engagement and for this educators were more motivated to and demonstrated behavioural intention in integrating more up-to-date gamification in the learning environment for a more engaged classes (Vanduhe, Nat, & Hasan, 2020).

Integrating gamification tools in the learning context technique has also been pointed up in many studies. With this technique technological games are incorporated withing the different educational scenarios allowing educators to develop a more interactive and enjoyable learning environment especially with these tools students get to receive instant feedback which is a constructive educational approach. Accordingly, students were found more motivated and engaged (Manzano-León, et al., 2021). With this, a study focused on examining 120 research was considered the highest extensively employed TAM elements that determine the adoption of electronic learning. The model was developed to include an investigation of the 435 participants' acceptance of the integration of electronic learning among five educational institutions in UAE. The findings revealed that degree to which the technological platform was successfully running and performing affected the PEOU in addition to its impact along with the PU of electronic learning by other elements such as the level to which participant felt emotionally satisfied with the technology used, the accessibility of variety of resources alongside with the depth of knowledge (Shaaban & Rabie, 2022).

An experimental research study conducted among higher education Saudi Arabian students, performed by Binyamin and colleagues to evaluate the integration of Learning Management Systems (LMS). With the use of TAM, they concluded the existence of six factors that played a huge role in affecting the peoples PEOU of the nominated technology. These factors are as follow the rating of pedagogical efficacy, accessibility and system usability and functionality, involvement and system interaction, and the level of educational resources quality (Binyamin, Rutter, & Smith, 2019).

Self-efficacy (SE)

SE was previously referred by Bandura (1986) as referred to SE as the trust and confidence an individual experience reflecting on his ability to prepare and accomplish the processes required for finalizing and delivering effectively an assignment (Bandura, 1986). While Christensen and Knezek (2015) described SE as the degree to which a person believes and trust in his potentials (Christensen & Knezek, 2015). Furtherg more, Bubou and Job (2022) suggested the relatedness of SE, Self-esteemed and self-worth to a person's confidence in certain situations (Bubou & Job, 2022).

Recent research highlights the situational aspect of self-efficacy and its correlation with confidence in handling challenging assignments. Chang and his colleagues demonstrated in their study that self-efficacy fluctuates depending on task type therefore signifies students' trust in executing speaking tasks (Chang, Zhou & Zhang, 2024). Similarly, Sellami and others revealed that people with elevated self-efficacy perceive problems as possibilities and opportunities for development thus demonstrate resilience in the face of adversity (Sellami, Santhosh, Michaleczek, Alazaizeh & Madad, 2025). Regarding the linkage be-, tween self-efficacy and technology, several studies have explored this association across various contexts and domains. Researchers have investigated many dimensions of technology-related self-efficacy, particularly technology self-efficacy (Yildiz Durak, 2018), internet self-efficacy (Wu et al., 2023), digital technology self-efficacy (Getenet, Cantle, Redmond, & Albion, 2024), and online learning self-efficacy (Zheng & Xiao, 2024)

Technology self-efficacy is the primary focus of this study which is characterized as a belief that an individual possesses regarding his own ability to employ technology successfully in a way that improves learning outcomes (Mekheimer, 2025). Students' ability to effectively and confidently employ virtual learning techp nologies, interact with instructors and peers, access educational resources, engage in discussions, and handle academic challenges is crucial to their success in virtual education (Masry-Herzallah & Watted, 2024). The studies that focused on the integration of Edu-tech resulted that SE is to be considered a main element that affect PEOU and Perceived utility (Chahal & Rani, 2022) (Navarro, Vega, Bayona, Bernal, & Garcia, 2023) (Lin & Yu, 2023).

The current study investigation with the use of SE, to see the level to which participants believe in their ability to integrate a virtual educational learning platforms for the purpose of improving the educa-

tional environment. Studies demonstrated that learners who possess high level of SE look at the up-to-date Edu-tech as a huge advantage that must be considered due to its usefulness and EOU. On another hand, learners who demonstrate less level; of SE are more likely to view it as another challenge in use (Navarro, Vega, Bayona, Bernal & Garcia, 2023). In 2023 study that included 659 postgraduate students in Ethiopia pointed that the PU is predicted by SE, which subsequently reflected with an impact on PEOU and the adoption of electronic learning (Belew, et al., 2024). While in their study of a SPACE-LMS system, Zulfani and colleagues revealed that SE impacted in a positive way PU and PEOU within an expanded TAM (Sesmiarni, Hoque, Susanto, Islam & Hendrayati, 2024).

Relationship between SE and PU

H1: there is a significant positive relationship between SE and PU

The link between SE and PU was explicitly examined by Chahal & Rani research which was provided with the participation of 570 participants students of higher education in India. alongside the personal innovation and social factors, the study revealed that more than half of the students that are confident in their ability to embrace new technologies are especially encouraged by their surrounding they are more likely to benefit from educational technology and use eLearning in their education (Chahal & Rani, 2022). While Belew and colleagues investigated this relation on medical and health students in Ethiopia which confirmed this link as it showed that the students' confidence in their own ability had a big influence on how their perception of the usefulness of educational technology such as eLearning platform which eventually impacted their intend to use (Belew, et al., 2024).

Relationship between SE and PEOU

H2: there is a significant relationship between SE and PEOU

The link between SE and PEOU was examined by many researchers such as Lin & Yu who's study resulted with the participation of 432 Taiwanese students that, having faith in ones capabilities in employing technology they tend to obtain high perspective of the usability of digital educational tools (Lin & Yu, 2023). Furthermore, ElSayed and Shabbat proved in their study that link pointing that students' SE was the reason for 36% of the EOU results (Elsayed & Shabbat, 2025).

Relationship between SE and BI

H3: there is a significant relationship between SE and BI

The relationship between SE and BI was found significant by researchers such as Chaveesuk & Chaiyasoonthorn, where resulted that higher SE directly raised students' desire and intention to use cloud-based lectures (Chaveesuk & Chaiyasoonthorn, 2022). Also, Mohamed M.G. and others, with the participation of 1,055 undergrads students from nursing in Egypt, Saudi Arabia, Jordan, and Yemen, they reached out that SE was a strong predictor to BI in using artificial intelligence tools (Mohamed, et al., 2025).

Study Design: Methodology, Study Community and Sampling (Population, Instruments, and Time Horizon).

Methodology

The methodology utilized in this research study is a mixed method, integrating both quantitative and qualitative techniques. A random sample of undergraduate business students was demanded to participate in filling in a structed designed

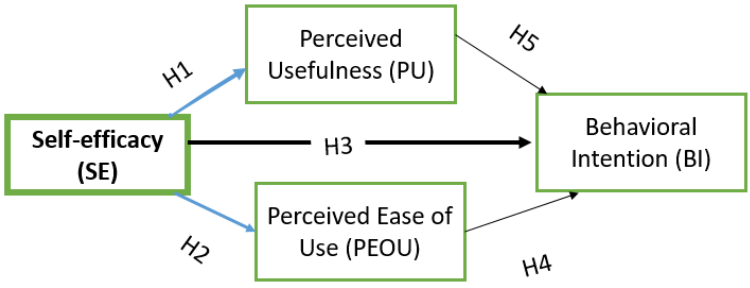

Figure (1) Research Model

questionnaires founded on TAM and SE scales. To further expand students' perspectives on electronic learning and verify the validity of the survey, two focus groups were established. This utilized approach shed light on either statical insights or context-specific understanding about how SE affects the acceptance of technology.

Study Population and Sample

This study's target demographic was undergraduate students attending a private Egyptian university's faculty of business administration. An approach depending on a random selection of the sample was utilized to make certain that all the academic years were appropriately represented. With this selected strategy based on the theory of probability, the accuracy and applicability of the results were improved ensuring that each-and-every student has an equal chance to be selected. During the quantitative part of the study, one hundred and one students who were randomly selected participated in a structured survey which served as the main data set for the statistical analysis. While two focus groups of students composed of twenty and twenty-five students respectively were held to ensure a validation of the survey design and delve deeper into how students were acquainted with the digital learning context.

Study Measures and Their Characteristics

This research study utilized a reliable scale to evaluate SE, BI, PU, and PEOU. Review by expert and Cronbach's alpha verified the instruments' strong consistency and cultural significance, where every question was rated a Likert scale with five points.

Data Collection Instrument

The survey was sent out to a random selection of students from various years of private business school in Egypt and consisted of a number of statements and questions. The questionnaire consisted of twenty-six questions, fifteen of which were meant to examine the perspectives of learners on electronic learning. It also included questions that dealt with demographic information including gender. The questionnaire was adapted from Šumak et al. (Šumak, Heričko, Pušnik, & Polančič, 2011). The self-efficacy scale also included 10 questions adapted from (Schwarzer & Jerusalem, 1995) (Schwarzer & Jerusalem, 1995). The topics were all presented as closed-ended questions, and the respondents' degrees of agreement were measured using a five-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree).

Study Data

Quantitative and Qualitative base of data was collected in this study from statistically reliable group of students. The following parts demonstrates the collected data how it was reliably and relevantly examined once reviewed and collected in a systematic manner using relevant statistical techniques.

Data Collection Method

To collect the data from the randomly selected undergraduate sample of business students, an online survey was utilized. The instrument was fine-tuned and verified by focus groups prior to full deployment.

Data Coding

The participants answers were numerically coded on a five-point Likert scale, as 1 meant "Strongly Disagree" and 5 meant "Strongly Agree". For statistical analysis, a distinctive code was given to each of the four variables (SE, PU, PEOU, and BI).

Data Analysis Methods

To investigate the causal connections of the variables, this study used statistical methods such as correlation, regression analysis with multiple variables and descriptive data analysis. Employing hierarchical-regression models to evaluate the effects of moderation and Cronbach's alpha was used to measure reliability.

Statistical Results

This study utilized two methods to effectively examine the reliability of the measurement instrument. The first one is the four-part questionnaire that was reviewed and refined by a panel of five academic experts who evaluated the content of each section for clarity, relevance, and appropriateness within academic and cultural contexts. The items in the questionnaire were considered clear, reliable, and culturally suitable by the panel. Second, Cronbach's alpha was used to evaluate the tool's internal consistency; all reliability were higher than the suggested level of 0.70, which means that it has adequate internal consistency (Hair, Celsi, Ortinau, & Bush, 2010).

Table 1. Reliability and validity

Scale	Self-Efficacy (SE)	Perceived Usefulness (PU)	Perceived Ease of Use (PEOU)	Behavioral Intention (BI)
Alpha	.993	.973	.978	.961

Table 2. Correlation, Mean, and SD

			Correlations			
	Mean	S.D.	Self-Efficacy (SE)	Perceived Usefulness (PU)	Perceived Ease of Use (PEOU)	Behavioral Intention (BI)
(SE)	26.6062	11.93363	1			
(PU)	27.8000	12.23996	.977**	1		
(PEOU)	19.6500	8.66887	.975**	.961**	1	
(BI)	14.5405	6.61746	.661**	.954**	.915**	1
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

As shown in table (2), the findings of this study indicate the lack of a significant impact of gender on the study variables. Nonetheless, a clearly demonstrated significant positive impact was observed between self-efficacy (SE) and several key constructs. Specifically, self-efficacy demonstrated strong positive correlations with Perceived Usefulness (PU) (r = .977**), Perceived Ease of Use (PEOU) (r = .975**), Attitude Toward Using Technology (ATU) (r = .961**), and Behavioural Intention (BI) (r = .954**). These results confirm a significant association between students' use of e-learning and the examined variables within the Technology Acceptance Model framework.

As per the statistical findings of this study, students demonstrate awareness of the benefits and convenience of incorporating e-learning into their educational practices. Their behaviour reflects their optimistic attitude towards e-learning and technological advancements. This has been supported by Elbyaly & Elfeky study, which emphasized that learner's positive attitude towards the given material depends on the active engagement in e-learning activities (Elbyaly & Elfeky, 2023).

Table (3a): Regression and Testing the Moderation Effect

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1	.363[a]	.131	.123	2.34616
2	.656[b]	.431	.419	1.90947

Table (3b) ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	82.484	1	82.484	14.985	.000[b]
	Residual	544.942	99	5.504		
	Total	627.426	100			
2	Regression	270.111	2	135.056	37.041	.000[c]
	Residual	357.314	98	3.646		
	Total	627.426	100			

Table (4a): Regression and Testing the Moderation Effect

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.363[a]	.131	.123	2.34616
2	.484[b]	.235	.219	2.21374

Table (4b) ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	82.484	1	82.484	14.985	.000[b]
	Residual	544.942	99	5.504		
	Total	627.426	100			
2	Regression	147.162	2	73.581	15.015	.000[c]
	Residual	480.264	98	4.901		
	Total	627.426	100			

Discussion

For a more complete picture of an issue or to shed light on certain contextual circumstances, researcher utilized mixed methods approaches by combining both qualitative and quantitative methods. This approach attempts to collect and examine data from both quantitative and qualitative sources allowing for a more complete and nuanced interpretation of the research problem. The method depends on a comprehensive and unified use of data in a combined (Creswell & Plano Clark, 2011). The qualitative part depended on conducting a pilot survey before its deployment. This required collecting additional input from the sample population. The focus groups consisted of two sets of participants, one with 20 students and the other with 25 students. All participating students were randomly selected to represent respectively the four academic years.

The application of mixed-method research in examining students' viewpoint is considered an opportunity to enhance teaching and learning methods particularly for university modules that place an emphasis on e-learning and technology. Through its employment, educators are more able to comprehend students' needs and preferences, which in turn allows them to alter their teaching methods and curriculum. It also provides an exploration of factors that impact learning such as the efficiency of incorporating technology and using e-learning techniques (Karakoç Öztürk, 2024).

Furthermore, it assists educators in recognizing the methods and recommendations proposed by students that are essential in developing technology-integrated modules for future educational projects at universities. Which provides greater insight and understanding of effective teaching strategies.

This study used TAM to examine the implication of students' self-efficacy on their perspectives regarding e-learning and technologies. This study addresses the impact of self-efficacy on students' perceptions of behavioural intention (BI), usefulness (PU) and ease of use (PEOU). The linkage between self-efficacy and the core dimensions within investigation were assessed using primary data collected via a structured survey.

Conclusion

The findings of this study highlight the fact that SE has a positive significant impact on PU, PEOU, and BI, which supports and confirm hypotheses H1, H2, and H3. These findings are in line with previous prior studies (Chahal and Rani, 2022; Thongsri et al., 2020; Fatima et al., 2017) (Chahal & Rani, 2022) (Thongsri, Shen, & Bao, 2020) (Fatima, Niazi, & Ghayas, 2017), which similarly confirmed the positive impact of SE in embracing technological advances. Students with augmented degrees of self-efficacy are more confident and able to adopt new educational technologies and demonstrate favorable perceptions of their usefulness and ease of use exhibiting positive opinions about its practicality, even cutting-edge platforms like metaverse-based learning environments. The elevated sureness that SE grants learners with the necessary confidence feeling that empowers them to carry on with the adoption of any advanced educational technologies, which eventually elevate the level of feeling motivated, engaged and satisfies, accordingly an increased in their PU and PEOU of these technological advancements.

The findings also demonstrated the positive impact of SE on PU and PEU, which support H1, H2, and H3. Other studies indicated the agreement with these findings such as (Thongsri, Shen, & Bao, 2020) and (Chahal & Rani, 2022). The elevated engagement and incentives reflected on by SE can advance the usefulness and user-friendliness of these platforms. Furthermore, Students with strong levels of self-efficacy are far more inclined to adopt new educational innovations and prefer to view new technologies, such as metaverse-based learning platforms. Students with high levels of SE are more likely to find metaverse-based learning tools helpful and simple to use. They do so because they think they possess the knowledge and skills required to succeed in a learning setting. Tables 3a, 3b, 4a, and 4b provide the moderating role of

PU and PEOU, which is confirmed by H4 and H5, as it shows that when students feel perceived usefulness (PU) and Ease of Use (PEOU), they activate the behavioral intention (BI) toward technology. The current study empirically validates the TAM in the context of the adoption and application of e-learning and technology among students in higher education. The extended TAM was used in this study to examine the use of e-learning in higher education at a private institution in Egypt. This study used a self-reported survey technique to determine students' opinions about how they utilize e-learning and other forms of technology to learn. According to the study's results Perceived usefulness (PU) is the strongest and most significant determinant of students' attitudes toward using e-learning, while perceived ease of use is also a factor that directly influences students' attitudes toward using e-learning. This indicates that if students believed that using e-learning would help them achieve better grades, gain more knowledge, and complete program requirements, they would like to use it. Numerous studies have also revealed that perceived usefulness may have a significant impact on how students feel about using e-learning platforms (Lee, Cheung, & Chen, 2005) (Ngai, Poon, & Chan, 2007) (Liu, Liao, & Pratt , 2009) (Al-Adwan, Li, & Al-Adwan, 2023).

Regarding the impact of PEOU on the intention of employment of metaverse, the results concluded with its irrelevance. Additionally, the individual's innovational capabilities, SE, and perceived cyber risk are to be considered main determinants of PE and PEOU (Al-Adwan, Li, & Al-Adwan, 2023). Students' perceptions of their "likeness" of utilizing the system are also represented by their understanding of how simple it is to use. This conclusion is reinforced by the findings of other studies (Ohliati & Abbas, 2019), which show that perceived usability has a substantial and considerable influence on perceived usefulness and that these two dimensions affect one another or follow one another in time. Students' judgments of how much they enjoy using e-learning do not determine their plans to use it.

In addition, the study analysis found no significant association between students' intention the adoption of electronic learning by the students and their PEOU. On the contrary, students who are in higher education are more likely to use an e-learning system if they see it as helpful to their learning process, which in turn strengthens their drive to use it. The findings of this study emphasise two main aspects that determine the actual adoption of e-learning: attitudes towards its use and Behavioural Intention. Notably, Behavioural Intention emerges as the most significant and robust predictor of e-learning utilization, as demonstrated by Teo (Teo, 2009).

Implications

The findings of this study suggest that e-learning is essential to the educational process. Students comprised 89 % of the sample who participated in this study. The students used technology without any issues or concerns. Since most students choose to employ electronic learning in their educational journey as it is perceived as being helpful for while studying, the e-learning system must offer all the e-services required for students' demands in their learning process. This research study concluded that the use of electronic learning platforms is crucial in the learning journey. The majority of participants in this study were students. The students had no problems or fears of using technology. Most students demonstrated preference in utilizing electronic learning as they find it useful and impactful which means the necessity for these technological platforms to provide all the supporting services that learners needs.

Effective use of e-learning systems is essential in higher education. The findings reported in this study can serve as a guide for researchers in their future studies. It is crucial that students feel that the e-learning system is more efficient, sufficient, and beneficial if they acquire suitable learning resources available on the system. To find external variables and examine which one of the different elements have a positive influence on students' perceptions related to the ease and use of e-learning systems and their usefulness for the students. Therefore, it is recommended that more research and investigations are needed to test the application of Technology Acceptance Model (TAM) in other fields.

Study Recommendations

According to the investigations conducted in this study and since students' confidence in their ability to use and adopt technology as an important tool in their learning journey, which is eventually considered crucial to its effective adoption, it is suggested that universities invest in specialized program or training aiming to provide the necessary support to students helping them in building confidence (SE) in using and integrating technology in their learning as it will makes them more likely to use it well. Another though in this regard can be useful through an application of a digital SE training during lectures or tutorials such as interactive simulations which scenario is built of the digital learning confidence. Interactive scenarios designed and structured in a way to improve the students' digital SE. This will eventually create a n interesting, safe gamified learning environment where all students will get the chance to practice the simulation assignment, receive constructive feedback, build confidence, and view the up-to-date technology as both easy to use and beneficial.

Also, it is recommended to design electronic learning platforms with a concept that is visually easy to use supported with guiding through sign. On another hand, educational policymakers may consider the launch of short training programs to boost students' digital SE. This could be conducted during the orientation phase. It is a way to provide students and newcomers a hands-on practice using digital platforms.

Furthermore, it is recommended that universities incorporate a digital confidence test, as Edu-tech can be considered intimidating for many firstcomers. Accordingly, the existence of early week SE detection and providing personalized assistance may avoid students' exclusion from technology. With the rapid spread of new technology, educational policy makers can develop dedicated applications to regularly collect student's feedback on the used electronic learning platforms and give them the area to suggest innovative ideas for further development. Lastly, as long as we are talking technology this study encourages that further future research to be conducted should looking at other factors-like psychological barriers beyond SE—that might affect how they accept and use technology, compare the digital SE between urban and Rural students especially with regard to an AI-based learning.

Limitations

This study's limitation is that it relies on students personal self-reported perceptions, which could be impacted by their personal biases. Second it considered TAM variables although many important psychological factors could be considered as well as environmental factors such as anxiety of up-to-date technology accessibility. Third, the study was conducted in an institution's setting where students where already exposed to electronic learning which may lead for the results not to be accurately applicable to students who less exposed of used to electronic learning.

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