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Evaluating factors affecting attitudes of IT-intensive and non-IT-intensive students towards e-assessment

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ABSTRACT

Despite the significant shift to distance computer-based test as an inevitable outcome of Industry 4.0 and the public lockdown of COVID-19, little effort has been made to research this new testing mode. To address this issue, this study targets two groups of information technology (IT)-intensive and non-IT-intensive students with an aim of investigating factors that effectively encourage each group to adopt online assessment and whether their majors cause any differences in the students' attitudes. Based on the student perception of e-assessment questionnaire (SPEAQ) with some slight modifications, a final 28-item survey was formed and distributed to 400 students. Results have shown that the factors of security, and affective factors were the top factors to impact both groups of students, while the impact of validity and practicality varied among the two groups and reliability and teaching-learning were at the bottom. Besides, there were no noticeable differences in the attitudes of students coming from different majors.

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1. INTRODUCTION

Enhancing the quality of teaching and learning has always been a national priority in Vietnam [1]. Over the years, Vietnamese governments have invested more than 20% of total budget expenditures in educational innovation projects, among which technology application is of great pre-eminence [2]. Currently, with an aim of responding to both COVID-19 and the current digital transformation, computer-based assessments have been applied to academic institutions in Vietnam more intensively than ever. However, this strategy still receives many opposing views as some institutions claim that computer-based assessment is still a newly unguided concept that might cost a huge sum of the national budget for implementation [3]. Moreover, numerous issues of this new assessment mode such as cheating, technical problems, and students' unwillingness to adopt still remained unsolved [4]. Regarding research gaps, whilst many studies have been done on the part of instructors, e-learning experts and educational technologists, little has been known regarding students' perception [5], especially in the computer-based test field [6], [7]. It is strongly posited that educationalists needed to study the test-takers' attitudes towards e-assessment. If students failed to have reliability in the test, their unwilling participation might seriously affect the learning outcomes [8].

Acknowledging the importance, the research decided to carry out a study utilizing the student perception of e-assessment questionnaire (SPEAQ) [9] to contribute more reliable findings towards this yet to

be rich research stream. Specifically, this study aims to propose a new measurement scale based on SPEAQ and the outcome variable of attitude; to identify which factors of e-exams mostly affect students' perception; to explore any differences in the mindset of students majoring in information technology (IT) and their counterparts; and to propose several approaches for future innovative plans based on the statistical findings of this research.

To fulfil these objectives, a qualitative study from experts and a quantitative study from students at IT faculty and others at Nguyen Tat Thanh University is used. Nguyen Tat Thanh University is a private university in the South of Vietnam which is well-known for its dedicated effort in digital educational innovations. As stated on the school's website, the school has their own e-learning institute whose objectives are to open learning opportunities for students at anytime and anywhere, provide up-to-date materials with quick access, and utilize technology to enhance students' learning and researching autonomy. During COVID-19, the e-learning institute tried hard to avoid interruptions in students' learning and assessment process by providing the learning form of e-learning. Regarding time, the research is carried out from March 2021 when both on-campus and off-campus students have at least one semester to experience their online training programs. Therefore, the school is an ideal place for research implementation.

2. LITERATURE REVIEW

2.1. Online assessment

Together with various types of computer-based teaching modules such as e-learning and blended learning, the integration of technology into assessment procedures seems inevitable with a typical example of electronic assessment. E-assessment is defined as an act of using technological tools to aid the school in assessing students' performance [9]. Meanwhile, e-exams are also seen as a type of assessments which store, deliver, record, and record student's marks and feedback. This process is supported by various technological gadgets such as laptops, desktop computers, smartphones, iPads, and tablets. Different delivering formats of Word documents, pdf, videos, photos, and simulations can also be used instead of paper [10]. From the functional aspect, e-assessment can be categorized into different types depending on the test's purposes. Considering their functions, e-assessments could be under the forms of diagnostic, formative and summative tests. And they are the power of instant marking and feedback that help e-assessments become far superior to their counterpart. Based on the time and place to take a test, e-assessment can be divided into synchronous and asynchronous assessments. Synchronous tests are often used for high-stakes exams, which require everything to run smoothly. Thus, students are asked to sit exams at the same time in one or more on-site PC labs. Meanwhile, asynchronous e-exams are often used for low-stakes, resource-intensive and un-invigilated tests. Thus, these tests can be done at any time with/without a specific time allotment [11].

2.2. Student attitudes to use e-assessment

The attitude to adopt technology has widely been studied due to its dramatic influence on customer satisfaction, and behavior intention, which later generates the actual use of digital products or services [12], [13]. In the field of e-assessment, the attitudes and behaviors of test-takers should be critically and thoroughly investigated to guarantee the test's face validity, students' engagement and cooperation levels [14]. Perceiving the same viewpoint, SPEAQ was introduced by Dermo in order to identify the factors that have caused the most significant effect on the perception of students at Bradford University, England [15]. However, due to the lack of the outcome variable, students' attitudes were only measured by the mean values of each item on the Likert 5-point scale to see whether students had positive (mean>3.25) or negative responses (mean<2.75). Succeeding researcher came up with the idea of combining SPEAQ with the outcome variable of 'willingness to adopt', which successfully enabled her to further identify factors significantly/insignificantly affecting students' attitudes of example in a private university of India [16].

In the context of Vietnam, e-assessment has just started to gain their popularity recently during COVID-19. Thus, no research has been found on attitudes of Vietnamese students towards this trend. For these reasons, the present study proposed a new version of scale based on SPEAQ and the outcome variable of attitude. When it comes to the topic of student attitudes' antecedents, six factors including affective factors, validity, practicality, reliability, security and pedagogy were suggested to be reliable measurements [15]. Among them, the affective factors refer to candidates' feelings during the exam time, with the main concentration on the sense of ease and comfort. Validity is related to the appropriateness of exam delivery modes to specific curriculum design and university studies. Practicality concerns the advantages and barriers of e-assessment as well as its practical applications. Reliability is defined as users' trust in the accuracy and fairness of e-assessment compared to paper-based assessment. Security can be interpreted as users' assertiveness about the ability of the devices to protect them from e-cybercrime. Finally, pedagogy is to do with the effectiveness of e-assessment on the teaching-learning process.

As earlier mentioned, most research projects related to e-assessment used the mean value of 6 proposed antecedents in SPEAQ to measure students' attitudes. In previous study [15], students responded positively to all 17 items of six constructs, with security and pedagogy being the two most satisfactory factors. Being recorded at the mean of 3.051, reliability and fairness failed to achieve positive attitudes. Six dimensions in the main scale were merged to only two dimensions of "comfort in use" and "learnings through e-tests", with the latter obtaining a higher positivity degree [17]. Not using mean value, Pillai and Prakash depended on T-statistics to identify the influence levels of each construct on learners' willingness to adopt computerized tests [16]. After all, besides the insignificant influence of reliability, the researcher posited that while the other five constructs significantly impacted willingness to adopt. Those previous findings have, therefore, led us to the following hypotheses: i) Affective factors positively affect students' attitudes towards e-assessment (H1); ii) Validity positively affect students' attitudes towards e-assessment (H2); iii) Practicality factors positively affect students' attitudes towards e-assessment (H3); iv) Reliability positively affect students' attitudes towards e-assessment (H4); v) Security positively affect students' attitudes towards e-assessment (H5); vi) Teaching and learning positively affect students' attitudes towards e-assessment (H6); and vii) The IT major cause no difference on students' attitude towards e-assessment (H7). The proposed model illustrating the above hypotheses is constructed as in Figure 1.

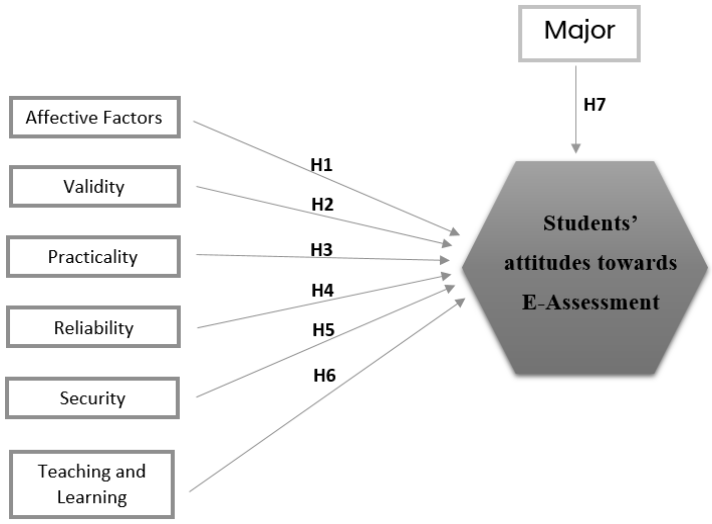

Figure 1. The final hypothesized research model

3. RESEARCH METHOD

Using SPEAQ as a reference, a measurement scale has to be developed in the specific context of Vietnam. To do that, a qualitative study of focus group discussion has been implemented with five experts holding directing positions. They include Director of E-learning Department, Deputy Director of E-learning Department, the Dean of Information Technology Faculty, the Deputy Dean of Information Technology Faculty, and the Director of Interdisciplinary Institute of Social Sciences at the University.

3.1. Qualitative: Focus group discussion

Initially, the discussion panel all decided to change all sentences with negative meanings into positive meanings. For instance, the statement of "I find it hard to concentrate on the questions when doing an online exam" into "I can focus on test better when doing online exam" (Table 1). This adjustment helps produce a consistent mindset in students' answers with the fifth answer option representing a completely positive attitude while the first being a completely negative one. However, for the need of creating a trap question in the survey, only statement AF5 was left unchanged when its meaning is negative and opposite AF1. This only reverse question is believed to keep the respondents alert but does not cause much trouble for our data interpretation [18].

Next, the experts went on looking closely at the content of each item to make sure it fits the culture of Vietnamese universities. For the second construct of reliability, items coded item I4 was removed as the idea is too general and, therefore, unclear. With the construct of validity, item coded I5 in the original SPEAQ is removed as being outdated. E-exams questions are now not confined into multiple-choice forms

only, but rather in various types such as gap-filling, information matching or even paragraph writing [11]. I2 and I4 have been reworded into VA2 and VA4 to become more apparent. With the construct of Practicality, item coded I3 in the original SPEAQ is removed with the perception that the length of e-exams is too short to cause any serious health problems, while I5 have been reworded into PR4 to become more transparent. About the construct security, only the first observed variable is dismissed as it is nearly impossible to conclude whether online assessment is equally secure as paper-based tests just by quick evaluation. Therefore, all other items were kept while the item I1 was removed due to the high potential of receiving inconsiderate answers. As for the teaching and learning construct, I2, I3, and I4 were dismissed as their meanings are too general and unclear. Meanwhile, two new benefits of e-assessment to the teaching-learning process are added under all panel members' agreement. Finally, the panel made no refinement as all items of regarding the affective factors and attitude constructs as they are clearly worded. Overall, the contents of refined items can be viewed in Table 1.

Table 1. Indicators retained in the final model

Constructs		Indicators
Affective factors	AF1	I feel comfortable when doing tests on e-learning
	AF2	I can focus on test better when doing online assessments
	AF3	Doing tests on computers is better because I get used to it
	AF4	I believe that e-exams is going to replace traditional paper-based tests sooner or later
	AF5	Doing tests on computers make me feel more stressful
Reliability	RE1	Marking by computers is more accurate because computers don't suffer from human mistakes
	RE2	The technology that the university uses to run online exams is reliable
	RE3	Online exams don't favor students with good IT skills because they are done by basic steps
	RE4	There is no chance of getting easier e-exams because questions are sorted by a test bank according to their difficulty
Validity	VA1	Online assessment is appropriate for my subject area
	VA2	The question types of e-exams are of various forms (matching, gap filling, paragraph writing)
	VA3	E-assessments test not only students' subject knowledge but also computer skills
	VA4	University students must have sufficient digital abilities to deal with computer tests
Practicality	PR1	Online assessments help save a certain amount of paper
	PR2	Technical problems can be forecasted and solved by the school
	PR3	It's an opportunity for students to interact and feel confident with technology
	PR4	E-assessment is more accessible as learners can take the test in their own comfortable places
Security	SE1	The scores of online assessments are securely saved
	SE2	Teachers have sensible methods to control cheating (i.e setting limited time, filming the whole process)
	SE3	The online exam system is well protected from hackers
	SE4	The information of account and password is well secured
Teaching and learning	TL1	The potential for immediate feedback could help students learn
	TL2	The scores are displayed as soon as the tests are completed, minimizing worrisome wait
	TL3	Online assessment goes hand-in-hand with e-learning
	TL4	Online assessments benefit students' experience with international standardized tests
Attitude	ATT1	It is desirable for me to undertake e-assessment
	ATT2	I think it is good for me to get accustomed to e-assessment
	ATT3	Overall, my attitude towards e-assessment is favorable

3.2. Quantitative: Instrument design

After designing a hypothesized model and refining scales that suit the Vietnamese context, all items would be measured using a five-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. Following this, the sample size was then calculated to prepare for the next part of formal data collection. Based on the formulas of [19], [20], the minimum sample size of 140 students is qualified to run both the EFA and model regression analysis for the results of this 28-item questionnaire. Aiming at comparing the attitudes of IT-intensive and non-IT-intensive students, 200 questionnaires were distributed to the Information Technology Faculty and another 200 to random students who do not belong to the IT Faculty. After the removal of faulty surveys due to either incompletion and/or trap questions, a total data from 151 and 161 surveys were collected from IT-majored and non-IT-majored groups respectively and was then kept in a strictly secured server before going through the data analysis process.

3.3. Measure assessment

Using the SPSS Version 25, model fitness was assessed by the two tests of reliability and EFA. As in the former test, the two requirements of Cronbach's alpha being within the range of $0.5<\alpha<0.95$ and Corrected item-total correlations being higher than 0.3 were applied [21]. The item AF5, whose item-total correlation was-0.374, was dismissed as it failed to meet the second requirement. After the removal, the test was re-performed, and all figures were within their threshold levels. The set of data is then entering EFA tests whose primary purpose is to examine the convergence validity of the scales. The KMO value of all proposed

items was 0.827, within the recommended range of 0.5-1.0 [22]. Next comes the Bartlett's Test of Sphericity. The p value=0.000<0.05, suggesting a high correlation between variables [23]. With the requirement of being higher than 50%, the total variance explained which is of 68.277 is acceptable [24]. As for Rotated component Matrix, the factor loadings of both independent and dependent variables are higher than 0.5. Furthermore, all constructs are also well-grouped into five clusters with no item leaving its initial independent group. Thus, those re-constructed factors are eligible for entering the regression analysis.

3.4. Hypothesis testing

In the next stage of data analysis, the model fitness and validity of hypotheses are tested through multiple regression analysis. There are also several criteria examined before the application of the standardized regression equation. As for IT-intensive group, the Durbin-Watson statistic of 2.157, which is around 2, proved that this regression model does not suffer from the first-order autocorrelation [21]. Next, the p value of the F-test at 0.000<0.05 indicated that the independent variables in the model have a linear correlation with the dependent variable. Lastly, the VIF values of 1.024 to 2.418 are all lower than 3, indicating that the regression model does not violate the phenomenon of multicollinearity [21].

Referring to non-IT-intensive group, the Durbin-Watson statistic was recorded at 2.157, the p value was 0.000, and VIF values slightly fluctuate between 1.164 and 1.615. Overall, these very last coefficients also met the requirements of multivariate regression analysis. Through multiple regression analysis, the extent of the six proposed factors impacting students' attitudes in IT-majored group and non-IT group is presented in Table 2 and Table 3, respectively.

Table 2. Coefficients of IT-intensive group

	Model	Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	0.324	0.446		0.725	0.469		
	AF	0.247	0.068	0.252	3.615	0.000	0.599	1.670
	VA	0.433	0.102	0.358	4.260	0.000	0.414	2.418
	PR	0.092	0.078	0.081	1.173	0.243	0.616	1.623
	RE	0.010	0.063	0.010	0.154	0.878	0.633	1.579
	SE	0.331	0.093	0.269	3.550	0.001	0.510	1.960
	TL	0.056	0.053	0.057	-1.046	0.297	0.977	1.024

Table 3. Coefficients of non-IT-intensive group

	Model	Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.084	0.649		1.669	0.097		
	AF	0.509	0.080	0.486	6.373	0.000	0.619	1.615
	VA	0.139	0.096	0.109	1.452	0.149	0.640	1.564
	PR	0.213	0.119	0.122	1.794	0.075	0.779	1.283
	RE	0.071	0.080	0.062	0.890	0.375	0.748	1.338
	SE	0.224	0.083	0.186	2.709	0.008	0.762	1.312
	TL	0.018	0.082	0.014	0.221	0.825	0.859	1.164

4. RESULTS AND DISCUSSION

Utilizing a scenario-based survey with 312 student volunteers and multivariate regression analysis, all hypotheses and 28 items have been proved to work well except for AF5, which was intended to use as a research trap question. Overall, all five proposed components of SPEAQ positively affect students' satisfaction. This research outcome is in line with the results found by [17], [25], [26]. From standardized coefficient Beta (β), the effects of each identified determinant towards students of two research groups are interpreted in subsection.

4.1. Affective factors

Affective factors were found to significantly affect both two research groups. Thus, we confirmed the finding of [27], [28], which elucidated that the perception of hedonic attributes is an excellent catalyst for academic efforts, attention, engaged emotions, and engaged behaviors of learners. Researching the context of Vietnamese secondary schools and high schools, the result of Tang, Nguyen, and Tran [29] further concluded that affective factors not only directly affected learners' attitudes, but also indirectly impacted their plans, intentions and commitments to a planned behavior in the future. Through our empirical finding, we confirm that this explanation also applies to the higher educational context of Vietnam.

4.2. Validity

Validity is found to significantly affect the IT group, but moderately affect the other. As our work is the first research following this trend, we could not find any previous support and hence, had to rely on our experience of university students' attitudes. It is self-explanatory that IT students would consider e-assessments tests more valid to their subject area as all their tests throughout the course are computer-based. This is why they also have higher expectations of digital literacy in the collegiate environment. Meanwhile, non-IT students usually have fewer interactions with computers during their study; thus, may not highly appreciate the validity of e-assessments.

4.3. Practicality

Contrasting to validity, practicality is regarded as a modest determinant of attitudes in the IT group, but a profound one in the non-IT group. Previous evidence is also unavailable to support our outcome as they did not follow this comparison method. However, investigating high school students in general, the study of [30], [31] both affirmed that practicality of e-assessment was a significant element in students' perspective for the reason that with less confidence in their own digital skills, non-IT students tend to concern more about instant supports of responsible staff to fix technical problems and higher chances to interact with computers. Therefore, this might explain why practicality turned out to be more critical for the attitudes of non-IT students than their counterparts in this study.

4.4. Reliability

Reliability was reported to play an insignificant positive role in the attitudes of both groups. This outcome is opposite to that of [15], [16]. Based on our insights into Vietnamese students, we suppose there were three main reasons endorsing our findings. Firstly, since students virtually took asynchronous tests during our research time, they could actively take control of their own computer quality. Moreover, students were always provided sufficient time to check the results and discuss with lecturers for any queries related to the tests. Lastly, as most of the online tests contained a huge number of short-answer questions, it is hard for students to either remember the test contents or compare the difficulties of their own tests with their peers. In the short run, more in-depth interviews on other universities are encouraged to carry out to examine these elucidations.

4.5. Security

Security is determined to have a profound effect on the attitudes of students in both groups. This outcome is in line with the finding of [16], [27]. In fact, previous studies have confirmed that when receiving feelings to security notifications, especially when being asked to react, most users tended to reject online learning system. Security in online learning is closely connected to authentication, encryption, access control, managing users and their permissions to ensure secure use and access [32]. Through our empirical finding, we also confirm that this explanation applies to the higher educational context of Vietnam.

4.6. Teaching and learning

Although the teaching-learning dimension played the least important role in the present study, its effect was rated highly significant [15], [16]. This contrast might be explained by the fact that the teaching-learning activities in Vietnam have long been associating with paper-based forms. Therefore, an abrupt shift to e-assessments due to COVID-19 may fail to provide students sufficient time to experience its benefits on learners' outcomes.

Based on the Independent sample T-test results, our study concluded that students at university have positive attitudes towards e-exams, and discipline does not cause dramatic significance in learners' mindset. Clusters such as education and software engineering were more in favor of e-exams while others such as chemistry, mathematics and biology were more reluctant [25]. This might be explained in the way that this students in this private university have been well-equipped with educational technology in their daily study, so most of them, regardless of majors, all feel comfortable and familiar with e-exams.

5. CONCLUSION

With all empirical findings, this study has enriched research literature regarding tech-based assessment from the view of test-takers, the amount of which is still of scarcity in Vietnam. Through the results focus group discussion, pilot tests and formal survey distribution, this study puts forward helpful suggestions to better refine the student perceptions of E-assessment Questionnaire, enhancing its applicability and sustainability for wide-spread implementation. Moreover, an independent variable of attitude was added to not only identify students' attitudes by calculating means, but also highlight the most influential factors affecting attitudes via regression analysis, providing more solid evidence for future policy construction.

As for managerial contributions, our findings support that major does not cause great differences in students' attitudes, the same guideline, with a strong emphasis on security and affective factors, could be applied to all departments at school. We recommend Nguyen Tat Thanh University in particular and higher institutions to construct technology-embedded academic landscapes which can maximize students' digital familiarity and proficiency. Furthermore, it is necessary for higher institutions to come up with effective maintenance policies so that students will less likely face technical problems and discouragement. Regarding security, it is reasonable for students to strongly demand that their account information and especially scores have to be kept securely safe as schools' systems are often hacked for the purpose of tampering scores or selling personal information. Educational institutions should invest budget in upgrading their information security management system so that any errors or attacks to program code could be warned timely. About the issue of cheating, besides common methods such as appointing different students with different tests or setting time limit, the use of proctored tests for institutions is highlighted. After requiring students to log in by their school-provided account, proctored tests will confirm students' identities by smart webcams, monitoring and flagging whenever there are signs of suspicious activities. All suggestions above are thought to be of significance to further enhance the school's capability to deliver e-assessment.

While providing some valuable findings, this study does encounter some limitations. Firstly, the sample size of non-IT groups remains limited compared to the number of 20,000 students at Nguyen Tat Thanh University. Therefore, it is suggested that future research could replicate our model (with or without adaptation) to further investigate each department and come up with more generalized outcomes. Furthermore, longitudinal studies, together with intensive qualitative designs might provide us more useful insights into students' attitudes, and the reasons behind their decisions.

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REFERENCES

[1] T. Việt, "High quality education for all should be Vietnam's priority," *The World Bank*, Apr. 2012. [Online]. Available: https://www.worldbank.org/en/news/feature/2012/04/25/high-quality-education-for-all-should-be-vietnams-priority (accessed Jan. 21, 2022).

[2] A. Kiet, "Vietnam spends 5.8% of GDP on education," *Hanoi Times*, Jan. 2019. [Online]. Available: https://hanoitimes.vn/vietnam-spends-58-of-gdp-on-education-1781.html (accessed Jan. 21, 2022).

[3] T. Huynh, "Concerns about computer-based national high school exams," (in Vietnamese), *Tuoitre News*, 2019. [Online]. Available: https://tuoitre.vn/nhieu-ban-khoan-khi-thi-thpt-quoc-gia-tren-may-tinh-20190926200012856 (accessed Jan. 21, 2022).

[4] R. Fuller, V. Joynes, J. Cooper, K. Boursicot, and T. Roberts, "Could COVID-19 be our 'There is no alternative' (TINA) opportunity to enhance assessment?" *Medical Teacher*, vol. 42, no. 7, pp. 781–786, Jul. 2020, doi: 10.1080/0142159X.2020.1779206.

[5] S. I. Malik and J. Coldwell-Neilson, "Gender differences in an introductory programming course: New teaching approach, students' learning outcomes, and perceptions," *Education and Information Technologies*, vol. 23, no. 6, pp. 2453–2475, Nov. 2018, doi: 10.1007/s10639-018-9725-3.

[6] A. Zabadi, "Investigate students attitudes toward computer based Test (CBT) at chemistry course," *Archives of Business Research*, vol. 4, no. 6, Dec. 2016, doi: 10.14738/abr.46.2325.

[7] B. Z. Waziri, F. A. Tahir, and M. B. Sani "Students' perception of computer based approach to examining undergraduate accounting courses in the University of Maiduguri, Nigeria," *European Journal of Business and Management*, vol. 11, no. 8, Mar. 2019, doi: 10.7176/ejbm/11-8-03.

[8] E. Pools and C. Monseur, "Student test-taking effort in low-stakes assessments: evidence from the English version of the PISA 2015 science test," *Large-Scale Assessments in Education*, vol. 9, no. 1, p. 10, Dec. 2021, doi: 10.1186/s40536-021-00104-6.

[9] M. Kehal, "Assurance of learning and accreditations in business schools: an AACSB perspective," *Journal of Economic and Administrative Sciences*, vol. 36, no. 1, pp. 82–96, Oct. 2019, doi: 10.1108/jeas-06-2018-0066.

[10] N. Utaberta and B. Hassanpour, "Aligning assessment with learning outcomes," *Procedia - Social and Behavioral Sciences*, vol. 60, pp. 228–235, Oct. 2012, doi: 10.1016/j.sbspro.2012.09.372.

[11] R. Bashitialshaaer, M. Alhendawi, and Z. Lassoued, "Obstacle comparisons to achieving distance learning and applying electronic exams during COVID-19 pandemic," *Symmetry*, vol. 13, no. 1, pp. 1–16, Jan. 2021, doi: 10.3390/sym13010099.

[12] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly: Management Information Systems*, vol. 13, no. 3, pp. 319–339, Sep. 1989, doi: 10.2307/249008.

[13] H. Li and J. Yu, "Learners' continuance participation intention of collaborative group project in virtual learning environment: an extended TAM perspective," *Journal of Data, Information and Management*, vol. 2, no. 1, pp. 39–53, Mar. 2020, doi: 10.1007/s42488-019-00017-8.

[14] M. Bahar and M. Asil, "Attitude towards e-assessment: influence of gender, computer usage and level of education," *Open Learning*, vol. 33, no. 3, pp. 221–237, Sep. 2018, doi: 10.1080/02680513.2018.1503529.

[15] J. Dermo, "e-assessment and the student learning experience: A survey of student perceptions of e-assessment," *British Journal of Educational Technology*, vol. 40, no. 2, pp. 203–214, Mar. 2009, doi: 10.1111/j.1467-8535.2008.00915.x.

[16] K. Rajasekharan Pillai and A. V. Prakash, "Technological leverage in higher education: An evolving pedagogy," *Journal of International Education in Business*, vol. 10, no. 2, pp. 130–146, Nov. 2017, doi: 10.1108/JIEB-09-2016-0034.

[17] H. K. Mahmood, F. Hussain, M. Mahmood, R. Kumail, and J. Abbas, "Impact of E-assessment at middle school student' learning-an empirical study at USA middle school students," *International Journal of Scientific & Engineering Research*, vol. 11, no. 4, pp. 1722–1736, 2020.
[18] M. Liu and L. Wronski, "Trap questions in online surveys: Results from three web survey experiments," *International Journal of Market Research*, vol. 60, no. 1, pp. 32–49, Jan. 2018, doi: 10.1177/1470785317744856.
[19] J. F. Hair, R. E. Anderson, R. L. Tatham, and W. C. Black, *Multivariate Data Analysis*. Upper Saddle River, N.J: Prentice Hall, 1998.
[20] S. B. Green, "How many subjects does it take to do a regression analysis?" *Multivariate Behavioral Research*, vol. 26, no. 3, pp. 499–510, Jul. 1991, doi: 10.1207/s15327906mbr2603_7.
[21] J. F. Hair, G.T.M. Hult, C. Ringle, M. Sarstedt, *A primer on partial least squares structural equation modeling (PLS-SEM)*, 2nd ed. Los Angeles: Sage, 2017.
[22] N. Ul Hadia, N. Abdullah, and I. Sentosa, "An easy approach to exploratory factor analysis: marketing perspective," *Journal of Educational and Social Research*, vol. 6, no. 1, p. 215, Jan. 2016, doi: 10.5901/jesr.2016.v6n1p215.
[23] G. Rasch, *Probabilistic models for some intelligence and attainment tests*. Chicago: MESA Press, 1993.
[24] J. F. Hair, Jr., R. E. Anderson, R. L. Tatham, and W. C. Black, *Multivariate data analysis with readings*, 4th ed. Englewood Cliffs, N.J: Prentice Hall, 1995.
[25] M. Hillier, "The very idea of e-Exams: student (pre) conceptions," in *Proceedings of ASCILITE 2014-Annual Conference Australian Society for Computers in Tertiary Education*, 2014, pp. 77-88.
[26] K. Awad, "Attitude of Ash-Shobak University College Students to E-Exam for Intermediate University Degree in Jordan," *Journal of Education and Practice*, vol. 7, no. 9, pp. 10–17, 2016.
[27] V. J. Shute, J. P. Leighton, E. E. Jang, and M. W. Chu, "Advances in the science of assessment," *Educational Assessment*, vol. 21, no. 1, pp. 34–59, Jan. 2016, doi: 10.1080/10627197.2015.1127752.
[28] D. Abun, T. Magallanes, and M. J. Incarnacion, "College students' cognitive and affective attitude toward higher education and their academic engagement," *International Journal of English Literature and Social Sciences*, vol. 4, no. 5, pp. 1494–1507, 2019, doi: 10.22161/ijels.45.38.
[29] T. T. Tang, T. N. Nguyen, and H. T. T. Tran, "Vietnamese teachers' acceptance to use E-assessment tools in teaching: An empirical study using PLS-SEM," *Contemporary Educational Technology*, vol. 14, no. 3, p. ep375, May 2022, doi: 10.30935/cedtech/12106.
[30] S. S. M. Huda, M. Kabir, and T. Siddiq, "E-assessment in higher education: Students' perspective," *International Journal of Education and Development using Information and Communication Technology*, vol. 16, no. 2, pp. 250–258, 2020.
[31] M. Appiah and F. V. Tonder, "E-assessment in higher education: A review," *International Journal of Business Management & Economic Research*, vol. 9, no. 6, pp. 1454–1460, 2018.
[32] K. Thamadharan and N. Maarop, "The acceptance of E-assessment considering security perspective: Work in progress," *International Journal of Social, Behavioral, Economics, Business and Industrial Engineering*, vol. 9, no. 3, pp. 874–879, 2015, doi: 10.5281/zenodo.1099873.

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